URINARY SYMPTOMS AND INCONTINENCE IN WOMEN:

RELATIONSHIPS BETWEEN OCCURRENCE, AGE PREVALENCE, PERCEIVED BOTHER AND QUALITY OF LIFE

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ABSTRACT

Introduction: Few published studies concerning the prevalence of urinary symptoms have used validated instruments, and the majority have looked at occurrence alone. While the absolute prevalence of incontinence may be of academic interest, it is the prevalence of incontinence which impacts on daily life that determines the need for relevant health services. This study was designed to determine the prevalence of urinary symptoms and their perceived impact in a community population of women.

Method: A postal survey using a validated self-completed questionnaire among all women aged over 18 years, registered with one general practice.

The prevalence rates and perceived impact of a range of urinary symptoms and their relationships with age, quality of life and sexual function were determined. Data were analysed using the chi-square test and the chi-square test for trend. Spearman's rank correlation was used to assess the relationship between symptom severity and perceived impact, and logistic regression to calculate odds ratios.

Results: 2075 completed questionnaires were returned, giving an 80% response rate. 1414 women (69%) reported some degree of incontinence, although only 578 (30%) indicated that it had social or hygienic impact. Other urinary symptoms reported included nocturia (19%), poor stream (19%), urgency (61%) and dysuria (23%). The most troublesome symptoms were incontinence for no obvious reason, nocturnal incontinence and nocturia, with 73%, 69% and 63% of sufferers finding these symptoms troublesome. Stress incontinence when experienced regularly affected quality of life, and both nocturnal and urge incontinence affected sexual function.

Conclusions: Incontinence and other urinary symptoms are more common than previously thought. These symptoms are not always perceived as bothersome or as having a social or hygienic impact and therefore many women who report urinary leakage do not require treatment. Nocturnal symptoms in women are commoner than might have been supposed and are extremely troublesome to sufferers.

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I dedicate this thesis to my husband, David, and my children, Louise, Andrew, Peter and Jonathan, who have supported me throughout my time as a research fellow and whose envelope opening skills proved invaluable!

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the Regulations of the University of Bristol. The work is original except where indicated by special reference in the text and no part of the dissertation has been submitted for any other degree.

Any views expressed in the dissertation are those of the author and in no way represent those of the University of Bristol.

The dissertation has not been presented to any other University for examination either in the United Kingdom or overseas.

SIGNED Lucy Smithbak DATE 16/02/01

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INTRODUCTION

CHAPTER 1

URINARY SYMPTOMS IN WOMEN: DEFINITIONS AND PATHOPHYSIOLOGY

Introduction

Urinary symptoms, and incontinence in particular, are recognised as common symptoms among women (Herzog and Fultz 1990; Norton 1990; Walters and Realini 1992), although many sufferers do not present themselves for treatment (Feneley et al 1979), perhaps through shame or the taboo nature of incontinence (Ashworth and Hagan 1993). Indeed incontinence has been described as a "Cinderella" subject (Millard and Moore 1996) with those experiencing incontinence not readily choosing to discuss their symptoms, perceiving incontinence as distasteful (Wells 1984). A lack of undergraduate medical teaching on the subject and professional ignorance surrounding incontinence have also contributed to incontinent people not receiving the treatment they might wish for from the medical profession (Sanderson 1991). Indeed it was estimated in 1989 that more than half of the 10 million Americans with urinary incontinence had received neither evaluation nor treatment (Consensus conference 1989).

Although there appears to be some ignorance concerning incontinence among the general medical profession, many studies have been published estimating the prevalence of incontinence among women (Thomas et al 1980; Brocklehurst 1993; Jolleys 1988; Rekers et al 1992a; O'Brien et al 1991) with prevalences varying from 5-25% for women aged 15-64 years, and 12-38% for women over 60 years. The US Agency for Health Care Policy and Research guidelines on incontinence, produced in 1992, suggest that the most likely prevalence rates are 10-25% for women aged 15-64 years (AHCPR 1992), with women twice as likely to experience incontinence as men (Brocklehurst 1993). Wide ranges are given because of difficulties in comparing studies with diverse definitions of incontinence, differing research designs and population samples and a

variety of, often unvalidated, measurement instruments (Nemir and Middleton 1954; Teasdale et al 1988; Simeonova and Bengtsson 1990; O'Brien et al 1991; Foldspang et al 1992; Brocklehurst 1993).

The International Continence Society (ICS) has suggested that incontinence should be defined as 'a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable' (Bates et al 1976). The implementation of this definition in prevalence studies is problematic owing to the difficulty in defining what constitutes a social or hygienic problem, therefore studies of incontinence have often employed definitions based on the frequency of urinary leakage (Jolleys 1988; Rekers et al 1992a; O'Brien et al 1991; Burgio, Matthews and Engel 1991) and have used a variety of methods for obtaining data, including interviews (Brocklehurst 1993) and self-completed questionnaires (Thomas et al 1980; Jolleys 1988; O'Brien et al 1991).

While most prevalence studies have focused on incontinence, symptoms such as nocturia, diurnal frequency, and urgency have also been shown to be common among women (Rekers et al 1992b; Kok et al 1992; Jolleys et al 1993).

While the absolute prevalence of incontinence may be of academic interest, it is the prevalence of incontinence which impacts on daily life that will determine the need for relevant health services. As already discussed, there is an acknowledged discrepancy between the number of women who admit to some degree of incontinence and the number who seek treatment (Feneley et al 1979). One method of assessing the impact of a particular symptom is to ask how much an individual is troubled by a particular symptom. Another method of assessing impact is to measure the effect that a particular condition has on an individual's quality of life. Quality of life is an abstract concept of well-being that has evolved in an effort to define the impact of different diseases on an individual and can be measured using a variety of instruments which are either generic or disease specific (MacDonagh 1996).

One aspect of daily life that is often neglected is the effect that different conditions have on sexual function. There are relatively few studies that focus on the effect of urinary symptoms on sexual function, although those that do have shown that urinary symptoms do have a negative effect on sexual well-being (Hilton 1988; Berglund and Fugl-Meyer 1996).

This study examines the relationships that exist between the prevalence of urinary symptoms in women in the general population, their perceived impact, and their effect on quality of life and sexual function, using a validated questionnaire.

Urinary incontinence is known to be costly to the Health Service. In 1991 it was estimated that about £50 million pounds was spent on pads and appliances (Sanderson 1991), while the cost of incontinence in the community in the United States was reported as approximately $6 billion per annum in 1986 (Hu 1986) and $26.3 billion for individuals aged over 65 years in 1995 (Wagner and Hu 1998).

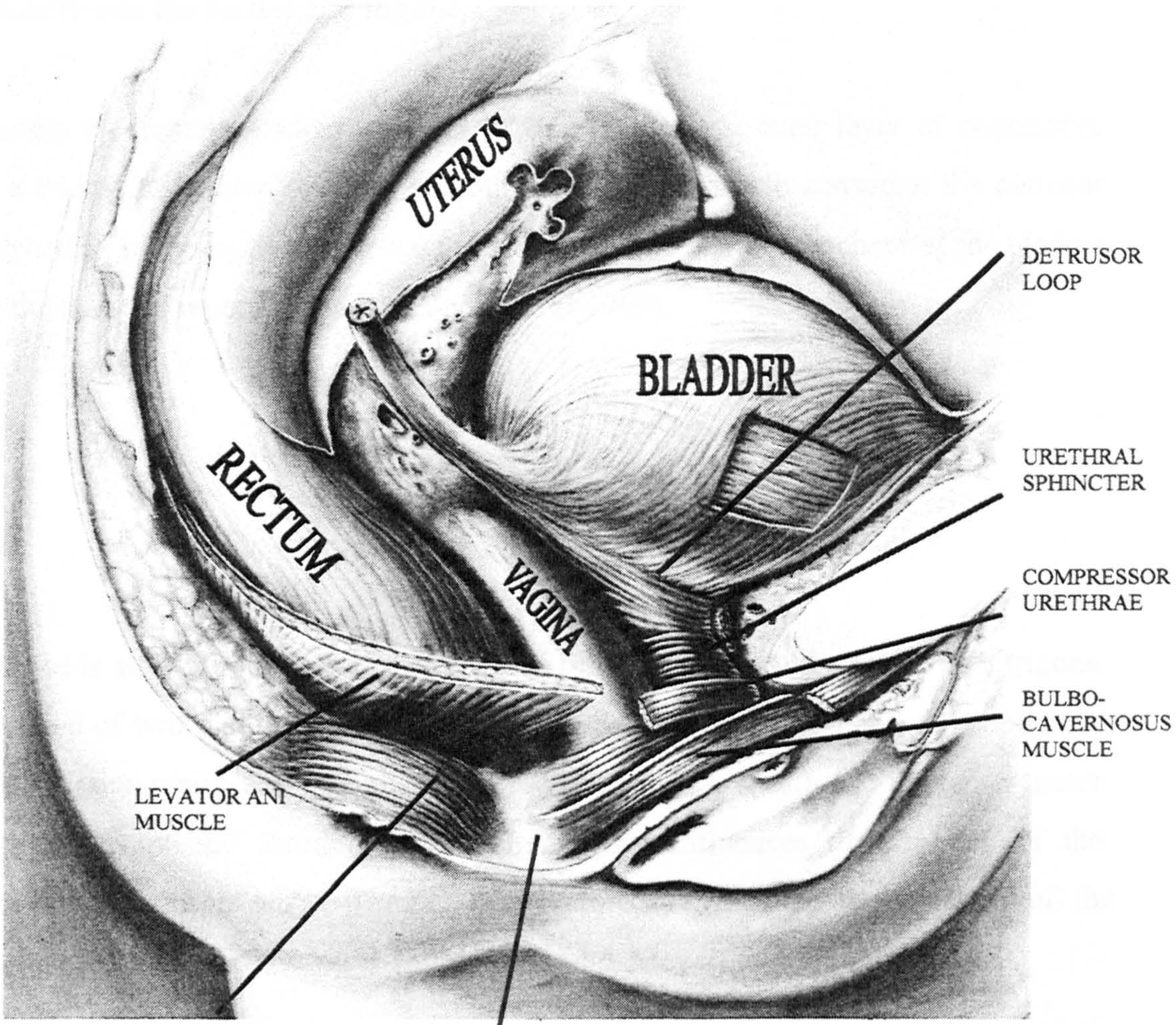
Urinary symptoms in women can thus be seen both to be common and to impact on the individual, and indirectly on society. Determining the prevalence of problematic urinary symptoms and their impact on an individual's quality of life and sexual function will increase our understanding of these common symptoms and could prove useful in the allocation of resources for incontinence.

The functional anatomy of the lower urinary tract in women

Introduction:

The lower urinary tract is composed anatomically of the bladder and urethra. Normal co-ordinated functioning of both bladder and urethra is required for the efficient storage and voiding of urine (Elbadawi 1991). The bladder is designed to act as a low pressure reservoir storing adequate volumes of urine and then expelling its contents to completion at a socially convenient time (Turner and Brading 1997). The urethra maintains an intrinsic pressure adequate to counteract any rise in intravesical pressure thereby preventing leakage of urine. Conversely it is capable of complete relaxation under voluntary control to allow voiding to take place. The maintenance of continence and normal voiding are therefore dependent on the normal functioning of both bladder and urethra.

Figure 1.1. The anatomy of the bladder, urethra and pelvic floor.



The female bladder:

The empty bladder is situated posterior to the symphysis pubis, and anterior to the vagina and as it fills it becomes situated intraabdominally. The bladder can be divided anatomically into the fundus and trigone.

Structurally the female bladder consists of three layers: an outer layer of connective tissue, a middle layer comprised of smooth muscle cells, which constitute the detrusor muscle, and an inner layer, the mucous membrane. The main component of the bladder wall is the detrusor muscle (Bro-Rasmussen et al 1965).

Trigone:

The trigone is situated between the ureteric orifices and the bladder neck. The trigone is composed of two distinct layers, unlike the remainder of the bladder: the superficial and deep trigone which are continuations of Waldemeyer's sheath and the lower ureter (Tanagho, Meyers and Smith 1968). The trigone influences the function of the ureterovesical junction while trigonal deficiency can influence the function of the vesicoureteric junction resulting in reflux (Tanagho, Meyers and Smith 1968).

Bladder mucosa:

The bladder mucosa consists of the lamina propria which forms a layer between the urothelium and the detrusor and a rudimentary muscularis mucosae (Dixon and Gosling 1983), consisting of small bundles of smooth muscle cells. The urothelium, apart from that of the trigone, is up to six cells deep and consists of layers of differentiated superficial cells, as well as intermediate and basal cells (Jost, Gosling and Dixon 1989). Mucus secreting glands have been described in the mucosa of the normal bladder.

Detrusor muscle:

The detrusor is the main component of the bladder wall and is comprised of a complex network of interlacing smooth muscle bundles. Longitudinal bundles tend to predominate in the inner and outer coats of the detrusor fusing posteriorly with the anterior vaginal wall (Bro-Rasmussen et al 1965). The orientation of the muscle bundles has been likened to the appearance of the interior of a golf ball.

The detrusor muscle possesses properties that enable it to fulfil its functions of ensuring that bladder pressure does not rise above filtration pressure and of generating adequate pressure to expel urine during micturition (Turner and Brading 1997). The bladder therefore has to allow an increase in volume without a significant rise in pressure. This relationship between changing volume and pressure is termed compliance (Bates et al 1976).

Detrusor muscle contraction:

Spontaneous contractile activity can be recorded in human detrusor muscle, as well as a number of other species (Brading and Williams 1990). This spontaneous activity has been shown to be myogenic as it is not abolished by nerve blockade. The lack of fused tetanic contractions suggest that there is poor electrical coupling between cells (Turner and Brading 1997), which is consistent with the absence of gap junctions in detrusor smooth muscle (Gabella and Uvelius 1990). The properties outlined above enable the detrusor muscle to increase in length without associated activity spreading throughout the muscle.

L-type calcium channel blockers and potassium channel openers have been shown to affect detrusor activity. Potassium channels play an important role in determining the 'resting' membrane potential of the cells and the shapes and frequency of spontaneous action potentials, while the inward calcium current plays an important role in excitation-contraction coupling (Gallegos and Fry 1994; Brading and Turner 1996).

Detrusor muscle contraction occurs secondary to the phosphorylation of the myosin light chain by calcium dependent kinase, and its dephosphorylation is the mechanism underlying the contraction-relaxation cycle of smooth muscle (Ebashi et al 1987; Kamm et al 1987). An increase in intracellular calcium mediated by cell surface receptors results in the formation of a calcium/calmodulin complex which activates myosin light chain kinase resulting in the phosphorylation of the regulatory light chain of myosin (Stull, Kamm and Taylor 1988). Phosphorylated myosin in association with actin can cleave ATP to produce energy for muscle contraction.

The detrusor maintains tone during filling enabling the active force produced by the smooth muscle cells to remain fairly constant over a large change in length, which allows for efficient voiding over a range of volumes (Turner and Brading 1997).

The female urethra:

The female urethra lies in approximation to the anterior vaginal wall and leaves the bladder at the internal urethral orifice. It consists of an outer muscle coat and inner mucous membrane continuous with that of the bladder. The muscle coat consists of both inner longitudinal smooth and outer circularly orientated striated muscle (Lapides and Diokno 1976). The structure of the smooth muscle in the urethra is different from that of the detrusor (Gosling and Dixon 1975). A collar of striated muscle cells surrounds the urethral lumen and is itself surrounded by a connective tissue septum that separates it from the periurethral musculature of the pelvic floor (Gosling and Dixon 1977). This collar is deficient posteriorly in the female urethra and is thickest in the middle third of the urethra (Oelrich 1983). The external sphincter contains Type I (slow twitch striated muscle fibres) that enable it to maintain tone over a long period of time thereby achieving active urethral closure and continence (Gosling et al 1981).

The urethra also contains a rich vascular plexus with specialised arteriovenous anastomoses (Huisman 1983) and occlusion of arterial supply to these vessels has been shown to affect intraurethral closure pressure (Rud et al 1980).

Supports of the female urethra:

The supports of the bladder neck and proximal urethra involve interconnections of: the arcus tendineus fasciae pelvis, the levator ani muscles and the endopelvic fascia around the vagina and urethra. The levator ani consists of both Type I and Type 2 (fast twitch) muscle fibres, consistent with its suggested role in actively assisting urethral closure during events that raise intraabdominal pressure (Gosling et al 1981). The endopelvic connective tissue that lies between the vagina and proximal urethra is attached to the fibrous band of the arcus tendineus fascia and the connective tissue around the urethra interdigitates with the levator ani muscle (DeLancey 1990). This anatomical arrangement contributes to continence (see below). As already described, the levator ani muscle, in common with the striated muscle in the external sphincter, contains Type I muscle fibres which allow it to maintain constant tone and support the urethra, even when not actively being contracted. The mechanisms for maintaining continence are outlined below.

The maintenance of continence:

The maintenance of continence is dependent, in simple terms, on the ability to store urine at low pressure in the bladder and to maintain adequate urethral pressure to prevent leakage of urine even when the intraabdominal pressure rises (Elbadawi 1991). The properties of the detrusor that enable it to fulfil its function have already been outlined in part above. In addition to the properties of the smooth muscle, the normal functioning of the bladder requires an anatomically normal bladder wall and the inhibitory effect of the sympathetic nerves on the parasympathetic nerve supply.

Urethral closure is maintained by several factors, although the relative importance of each individual factor is unclear. The contractile properties of the intraurethral striated muscle have already been described, while the anatomical configuration at the bladder neck, including ligamentous support, submucosal vascularity, transmission of abdominal pressure to the proximal urethra, urethral mucosal surface tension, urethral elasticity and urethral length all contribute to urethral closure.

Cadaver dissections performed by DeLancey have shown the importance of the ligamentous support of the urethra in maintaining continence. During his research he noted that there was a sling formed by a segment of the anterior vaginal wall attached to the levator ani muscle and the arcus tendineus muscle. Contraction of the levator ani muscle moves the vagina anteriorly towards the pubic bones, thereby compressing the urethra (DeLancey 1988).

Neurophysiology of the storage and voiding mechanisms:

The lower urinary tract differs from other visceral structures in its dependence on the central nervous system making the bladder a unique organ where viscero-somatic integration takes place (Mundy and Thomas 1994). The lower urinary tract is supplied by parasympathetic, sympathetic and somatic nerves, micturition occurs secondary to co-ordination of the different nerve activities.

Outline of the nerve supply of the lower urinary tract:

The neurophysiology of the lower urinary tract is both complex and contentious. The principle excitatory neurotransmitter in the lower urinary tract is acetyl choline, with some adrenergic nerve fibres supplying the urethral sphincter and bladder (Gosling, Dixon and Landon 1977; Ek et al 1977). Other neurotransmitters have also been described, such as adenosine triphosphate (ATP) (Burnstock 1979; Brading and Williams 1990), vasoactive intestinal polypeptide (Gu et al 1983) and neuropeptide Y (Hoyle 1994), although their exact role is unclear.

The parasympathetic nerve supply to the lower urinary tract originates in the sacral part of the spinal cord. Preganglionic parasympathetic nerve fibres originating at S2-4 and run into the pelvic plexus as the pelvic nerves (de Groat et al 1981). These preganglionic nerves either synapse with one or more postganglionic branches, or run

straight through to ganglia in the wall of the bladder where they synapse; they are chiefly excitatory to the bladder.

The sympathetic nerve supply of the lower urinary tract derives predominantly from the hypogastric nerve (T10-L2) arising from synapses in the inferior mesenteric plexus (de Groat 1975). The sympathetic nerve supply intermingles with the pelvic parasympathetic plexus to form the pelvic plexus. Sympathetic nerves exert an inhibitory effect on the parasympathetic supply to the bladder, thereby inhibiting contraction of the detrusor muscle (Blaivas 1982; Creed 1995).

The striated muscle of the intraurethral sphincter is under voluntary control with the relevant nerve cell bodies situated in the anterior horn of S2-4 (Onuf's nucleus) (Schrøder 1981) and nerve fibres running with the pelvic nerves. Somatic innervation to the pelvic floor is through the pudendal nerve (S2-4) (McCrea and Kimmel 1954).

Sensory receptors to pressure, pain, temperature and tension lie in the bladder wall (de Groat and Ryall 1969), with afferent fibres travelling in parasympathetic, sympathetic and somatic nerves to the thoracolumbar cord (T10-L2) and to S2-4 where some synapse with preganglionic (efferent) neurones, while others ascend the spinal cord.

Central control:

The co-ordination of micturition is a complex procedure and is under central control with the cerebral cortex, thalamus, hypothalamus, limbic system, basal ganglia, cerebellum, brain stem "pontine micturition centre", nucleus locus coeruleus and spinal cord "sacral micturition centre" all contributing to some extent (Bradley, Timm and Scott 1974).

During the storage phase the afferent fibres in the bladder wall do not cause activity in postganglionic efferents until a critical frequency is reached. This occurs partly because the parasympathetic ganglia act as filters, ensuring that, when preganglionic activity is

low, impulses are not transmitted, and also because of sympathetic inhibition of parasympathetic ganglionic transmission (Blaivas 1982).

Micturition occurs secondary to contraction of the detrusor muscle as the result of a burst of efferent activity. This increase in efferent activity occurs when the inhibitory sympathetic effect and inhibitory neurones of the spinal cord are themselves inhibited by supraspinal impulses from the pons in response to threshold levels of afferent activity and voluntary facilitation: urethral relaxation occurs synchronously. Voiding is under voluntary control, with areas of the frontal lobe including the superior frontal gyrus and corpus callosum being involved in the process (Blaivas 1982; Mundy and Thomas 1994).

Lower Urinary Tract Symptoms in Women

Lower urinary tract symptoms, and urinary incontinence in particular, are recognised as common problems causing considerable distress to women. Indeed incontinence is recognised as the most important factor contributing to institutionalisation of the elderly (Ekelund and Rundgren 1987), while nocturia, a symptom often neglected in women, has been found to be a risk factor for falls in the elderly with associated morbidity and economic implications (Stewart et al 1992). Indeed falls in the elderly are an important cause of disability and death (Hindmarsh and Estes 1989). A recent qualitative study has given some insight into the common perceptions of incontinence confirming urinary incontinence as a taboo subject, with sufferers finding it difficult to focus on their own problems because of feelings of shame (Ashworth and Hagan 1993).

The bulk of literature relating to lower urinary tract symptoms in women concerns incontinence, although other urinary symptoms are known to be prevalent in women.

In an attempt to standardise the definitions and diagnosis of lower urinary tract symptomatology, the International Continence Society (ICS), a society dedicated to introducing standards for the investigation and interpretation of urodynamic investigations, has published a series of standardisation reports. These are concerned with the standardisation of terminology relating to lower urinary tract symptomatology and diagnostic techniques. The first standardisation report (Bates et al 1976) provided definitions relating to incontinence. These are outlined in Table 1.1.

Although urinary symptoms alone may lead to a correct pathophysiological diagnosis, this is not always the case. Indeed the bladder has been termed an "unreliable witness" (Bates, Whiteside and Turner-Warwick 1970), in recognition of the difficulty in relying purely on lower urinary tract symptomatology when making a diagnosis. Urodynamic investigations (qv), involving the measurement of pressure in the bladder and abdomen during both the filling and voiding phases of micturition, have been developed in order to address this difficulty.

Definitions of common lower urinary tract symptoms in women

For convenience, symptoms relating to lower urinary tract dysfunction can be divided into symptoms relating to either the storage or voiding phase of the micturition cycle. The bulk of literature, regarding storage symptoms in women, concerns urinary incontinence. Incontinence has been defined by the International Continence Society as "a condition where involuntary loss of urine is a social or hygienic problem and is objectively demonstrable" (Bates et al 1976). Incontinence can be subdivided into stress, urge, reflex and overflow incontinence and nocturnal enuresis. Nocturnal enuresis is the term that is used for the complete emptying of the bladder while asleep. The ICS definitions for the other types of incontinence are outlined in Table 1.1. Mixed incontinence is a term used, both in clinical practice and the literature, to describe a combination of stress and urge incontinence.

Other common storage symptoms include urgency, frequency and nocturia. Urgency denotes an urgent desire to void for fear of leakage, and nocturia has been defined as

the arousal from sleep to void (Barker and Mitteness 1988). Nocturia is considered as abnormal if voiding occurs more than once a night (Hilton and Stanton 1982).

Studies using frequency/volume charts in community populations have helped define normal voiding patterns. Micturition is described as frequent when it occurs more than once every two hours during waking, or greater than eight times a day (Sommer et al 1990).

Voiding symptoms include hesitancy, which can be defined as a delay in initiating micturition, straining to void and poor stream. Urinary stream can be described not only by its strength, but by its pattern. Intermittency is the term used to describe a urinary stream that is not continuous.

The above definitions are used throughout this study.

Table 1.1. International Continence Society (ICS) definitions of incontinence.

Symptom	ICS definition
• incontinence	involuntary loss of urine which is a social or hygienic problem and is objectively demonstrable
• stress incontinence	involuntary loss of urine when exercising physically (in the broadest possible sense of the words)
• urge incontinence	involuntary loss of urine associated with a strong desire to void
• reflex incontinence	involuntary loss of urine due to abnormal reflex activity in the spinal cord
• overflow incontinence	involuntary loss of urine when the intravesical pressure exceeds the urethral pressure, due to an elevation of intravesical pressure associated with bladder distension, but in the absence of detrusor activity

Pathophysiology relating to common lower urinary tract symptoms

Much of the current knowledge regarding the function of the lower urinary tract has been acquired by the study of the hydrodynamics of micturition. Pressure studies of the lower urinary tract during filling and voiding are employed in the management of lower urinary tract symptoms. The different techniques are known collectively as urodynamic investigations. These will be described in more detail later.

Normal function during the filling phase of micturition:

Normal sensation:

The bladder fills with urine at a rate of about 1 ml/minute. During the early stage of bladder filling no sensation is experienced. As filling progresses an early sensation is felt which can be easily suppressed. This is termed the first desire to micturate or 'FDM', and is felt at a bladder volume of approximately 150 mls. As filling continues the sensation becomes stronger and less easy to ignore. Voiding normally occurs at this time, which can be termed the functional bladder capacity but, if filling continues, a more intense sensation of bladder distension will develop (Nathan 1956).

Detrusor function:

As already described in the section concerning the pathophysiology of the detrusor muscle, during normal bladder filling there is an increase in bladder volume with no significant increase in intravesical pressure. This is termed 'accommodation' (Bates et al 1981). No involuntary contractions of the detrusor are observed during normal filling, and the bladder can be termed 'stable'.

Urethral function:

The normal urethral closure mechanism maintains a positive closure pressure during filling, even in the presence of increased intraabdominal pressure. This is achieved by several factors, such as muscular occlusion, the anatomical configuration of the bladder neck, urethral length, mucosal surface tension, and inherent elasticity. A more detailed description of the components of the urethral closure mechanism is outlined in the section concerning the functional anatomy of the lower urinary tract.

Bladder capacity:

Functional bladder capacity can be assessed with the use of frequency/volume charts (qv) or urinary diaries. The functional capacity is that volume at which the sensation to void becomes intense and voiding occurs. Urinary diaries demonstrate that there can be a wide variation in functional capacities from day to day in one individual. The largest capacity usually occurs as the first void of the morning, and capacities of between 300-600 mls are regarded as normal.

Storage dysfunction:

The International Continence Society (qv) has defined several abnormalities of the filling or storage phase of micturition. The definitions of three that commonly occur in women are described below.

The unstable detrusor is one that is shown objectively to contract, spontaneously or on provocation, during the filling phase, while the patient is attempting to inhibit micturition (Bates et al 1981). This condition is also termed detrusor instability (see figure).

A hypersensitive bladder is one in which there is increased bladder sensation associated with a normal cystometrogram, albeit with a reduced cystometric capacity (Bates et al 1981).

Genuine stress incontinence is the involuntary loss of urine when the intravesical pressure exceeds the maximum intraurethral pressure, but in the absence of detrusor contraction (Bates et al 1976).

Storage symptoms:

Urgency and urge incontinence

Urgency or a desire to void for fear of leakage is a common symptom in women (Jolleys et al 1993). If accompanied by urinary leakage it is termed urge incontinence. Urgency may be associated with several pathophysiological conditions including detrusor instability, carcinoma in situ of the bladder and interstitial cystitis, and can also be related to bacterial cystitis. Cystometry (qv) is necessary to determine whether detrusor instability is the cause of urgency. Urgency can be categorised by the presence or absence of involuntary detrusor contractions, otherwise known as detrusor instability (Bates et al 1976). Urgency associated with the presence of involuntary detrusor contractions can be termed motor urgency, whereas the term sensory urgency denotes the symptom of urgency with a urodynamically proven stable bladder.

Detrusor instability has been shown to develop in response to obstruction in the pig (Sibley 1985) and is associated with bladder outlet obstruction in men; in neurological disease involving the bladder it is termed detrusor hyperreflexia. Detrusor instability in women is often idiopathic (Brading and Turner 1994).

As its name implies the aetiology of idiopathic detrusor instability is unclear. Moore et al (1992) found that the amount of acetylcholinesterase-positive subepithelial nerves in

the bladder is increased in detrusor instability, which may explain the urgency experienced by those with detrusor instability. However no explanation was given for this pathological change. Various authors have described an increased incidence of neurotic traits in patients with idiopathic detrusor instability suggesting a psychosomatic cause for their symptoms (Crisp and Sutherst 1983; Macaulay et al 1987) although this finding has not been uniform (Lagro-Janssen, Debruyne and van Weel 1992). Hypnosis has been used with reported success in the treatment of detrusor instability lending some support to this hypothesis (Freeman and Baxby 1982). However, attempts to correlate psychoneurotic status with the outcome of treatment have not consistently shown that abnormal psychoneurotic status correlates with poor response to drug treatment (Moore and Sutherst 1990).

Detrusor stability is maintained by the reflex suppression of excitatory neural influence on muscle cells (Elbadawi 1991). The main pharmacological treatments for detrusor instability currently available therefore involve the use of anticholinergic agents (Cardozo 1986).

However, more recent theories suggest that idiopathic detrusor instability may result from the electrical spread of activity arising from within the detrusor itself which results in synchronous activation of the detrusor, and a secondary rise in intravesical pressure (Brading and Turner 1994). Studies of detrusor muscle strips in vitro have indeed shown that spontaneous contractions develop more readily in muscle strips from bladders exhibiting detrusor instability than from normal bladders, and there is evidence from these experiments that vasoactive intestinal polypeptide may have a role in suppressing these detrusor contractions (Kinder and Mundy 1985; Kinder and Mundy 1987). It is proposed that the intrinsic changes in the detrusor muscle are secondary to long-term reduction in excitatory motor nerve activity (Brading and Turner 1994). This theory is supported by evidence that denervation of the pig bladder results in instability (Sethia, Brading and Smith 1990).

In conclusion, urgency and urge incontinence are relatively common symptoms in women. One of the commonest causes of urgency and urge incontinence in women is

idiopathic detrusor instability. Further work is necessary to establish the pathophysiological processes behind this condition.

Stress incontinence:

Stress incontinence, according to the first standardisation report of the International Continence Society (Bates et al 1976), denotes a symptom: the involuntary loss of urine while coughing or exercising; a sign: the involuntary loss of urine secondary to a rise in abdominal pressure; and a condition which it terms genuine stress incontinence.
Genuine stress incontinence is defined as the "involuntary loss of urine when the intravesical pressure exceeds the maximum urethral pressure but in the absence of detrusor activity" (Bates et al 1976).

As previously outlined, the pressure in the urethra needs to remain greater than the vesical pressure when the abdominal pressure increases in order to maintain continence. The preservation of an adequate pressure in the urethra that can resist an increase in abdominal pressure is achieved through a combination of urethral sphincter pressure and the support of the bladder neck, as described earlier in this chapter.

Collagen has been shown to play a role in the generation of intrinsic urethral pressure and changes in collagen composition may contribute to sphincter weakness (Versi et al 1988; Keane et al 1997). Oestrogen is commonly perceived as having a role in the maintenance of continence (Cardozo 1990), as incontinence is known to increase in prevalence with increasing age (Brocklehurst 1993). Oestrogen receptors have been found in the squamous epithelia of the female lower urinary tract (Blakeman, Hilton and Bulmer 1996). Oestrogen may act by affecting soft tissue elements that contribute to urethral tone, such as collagen and the submucous venous plexus. Their role in the maintenance of continence is, however, still controversial and there is no consistent evidence that treatment with oestrogens improves urinary leakage (Hilton and Stanton 1983; Cardozo 1990; Fantl et al 1996; Jackson et al 1999).

Stress incontinence has been divided into Types I and III: genuine stress incontinence secondary to bladder neck hypermobility can be termed Type I stress incontinence (McGuire et al 1980), while pure urethral sphincter weakness corresponds to Type III stress incontinence (McGuire et al 1980).

The pelvic floor also plays an important role in the maintenance of continence by supporting the bladder neck. DeLancey (1990) has demonstrated that the support of the proximal urethra is important in achieving continence. The contribution of the pelvic floor to continence is mediated by the pelvic diaphragm, which when contracted pulls the vagina against the posterior surface of the urethra (DeLancey 1988). In practice stress incontinence is often a combination of the two types with both sphincter weakness and bladder neck hypermobility making a contribution.

Analysis of pelvic floor biopsy samples from women suffering with stress incontinence have shown a significant increase in the number of muscle fibres showing pathological damage (Gilpin et al 1989). This damage may be related to childbearing and may in part explain why there is an association between parity and stress incontinence (Yarnell et al 1982; Wilson, Herbison and Herbison 1996). Other studies have examined the neurophysiology of the terminal branches of the pudendal nerve supplying the pelvic floor in women with stress incontinence, and a normal control group, and have found evidence of denervation injury in women complaining of stress incontinence (Smith, Hosker and Warrell 1989; Allen et al 1990).

In conclusion, stress incontinence is the commonest form of incontinence in women (Holst and Wilson 1988). The aetiology of stress incontinence is probably multifactorial with parity, age and connective tissue defects all playing a role.

Nocturia and nocturnal polyuria

Nocturia, or the arousal from sleep to void (Barker and Mitteness 1988) and it is often viewed as abnormal if voiding occurs more than once a night (Hilton and Stanton 1982). Nocturia becomes increasingly common with increasing age (Brocklehurst et al

1972) and is associated with morbidity in relation to its association with falls in the elderly secondary to night-time toiletting (Fine 1959; Stewart et al 1992). It is also recognised as having a negative effect on a woman's sense of well-being because of sleep disturbance (Barker and Mitteness 1988). Nocturia may be the presenting symptom of sleep disorders, such as sleep apnoea (Pressman et al 1996). However, it is more common in women with storage diurnal symptoms and therefore also associated with lower urinary tract pathology (Barker and Mitteness 1989; Diokno 1995). Nocturia may represent nocturnal frequency, the frequent voiding of small volumes, possibly secondary to detrusor instability, or nocturnal polyuria, the voiding of large amounts of urine overnight, which may indicate pathology apart from the lower urinary tract (Mathiessen et al 1996).

There is no consensus as to the precise definition of nocturnal polyuria. Some authors have compared voided volumes during 12 hour periods overnight with a similar period during the day (Asplund and Åberg 1992). Other definitions employed have included the voiding of more than 33 or 35% of the total 24 hour output of urine in eight hours overnight (Carter, McConnell and Abrams 1992; Saito et al 1993).

In common with nocturia, nocturnal polyuria probably has a variety of causes (Donahue and Lowenthal 1997). In addition to those already outlined, nocturnal polyuria may occur secondary to the poor concentrating abilities of the kidney with increasing age, or to postural factors, with dependent oedema in the limbs being reabsorbed overnight a contributing factor (Guite et al 1988; Lubran 1995).

Hormonal influences have also been suggested as causes for nocturnal polyuria, with arginine vasopressin and atrial natriuretic peptide both being implicated in its aetiology. Arginine vasopressin (antidiuretic hormone) is synthesised from a precursor in the hypothalamus and secreted by the pituitary in response to changes in osmolality. Arginine vasopressin acts on the collecting duct and distal convoluted tubule to cause water reabsorption and is known to exhibit a diurnal variation in secretion in normal individuals (George et al 1975). Atrial natriuretic peptide (ANP) is produced by cardiac atrial myocytes and secreted in response to atrial distension and tachycardia (Kaye and Camm 1985; Zullo 1991). ANP reduces renin activity and aldosterone synthesis and

produces a diuresis and natriuresis (de Bold et al 1981). It is postulated that a loss of the diurnal rhythm of arginine vasopressin in the elderly contributes to nocturnal polyuria; this has been termed "the nocturnal polyuria syndrome" (Asplund 1995). Other authors have found that people voiding large volumes overnight produce increased levels of ANP, possibly secondary to subclinical cardiac failure (Carter, McConnell and Abrams 1992).

Nocturia in women may therefore represent either nocturnal frequency or nocturnal polyuria. It is important to distinguish between these two conditions before treating symptomatic women. Nocturnal frequency is likely to be secondary to lower urinary tract pathology, whereas nocturnal polyuria is probably multifactorial and secondary to pathology unrelated to the lower urinary tract.

Nocturnal enuresis

Nocturnal enuresis can be defined as bedwetting occurring after the age of five, when bladder control is normally expected to have been achieved (Forsythe and Redmond 1974), and is accepted as being a common condition in children (Blomfield and Douglas 1956; Swithinbank et al 1998). Nocturnal enuresis is reported as having a spontaneous remission of between 14 and 16% a year depending on age (Forsythe and Redmond 1974), and therefore decreases in prevalence with increasing age. It is described more commonly in boys than girls, although the sex difference in prevalence has not always been found to be statistically significant (Devlin 1991; Swithinbank et al 1998). In boys monosymptomatic nocturnal enuresis is common, whereas in girls nocturnal enuresis often coexists with daytime symptoms of urgency or daywetting (Hellstrom A-L et al 1990; Jarvelin et al 1988).

The pathogenesis of nocturnal enuresis is not fully understood, but is probably multifactorial (Nørgaard 1997), with one or all of the following factors playing a role: heredity (Eiberg 1995), detrusor instability (Linderholm 1966) or loss of the diurnal rhythm of antidiuretic hormone (Nørgaard, Pedersen and Djurhuus 1985).

Nocturnal enuresis is rarely thought of as a clinical problem in adult women and there is a paucity of literature on the subject. Studies of adult women suggest that nocturnal enuresis is relatively rare, occurring in 4% (Brieger et al 1996) of females aged 10-90 years. Previously published studies of nocturnal enuresis or nocturnal incontinence in adult women have, however, used unvalidated instruments.

It is not clear whether bedwetting in adult women has the same physiological basis as that in children. Nocturnal enuresis in adult women is thus perhaps better termed nocturnal incontinence, as there is not always evidence of complete bladder emptying while asleep, as the term nocturnal enuresis implies.

In conclusion, nocturnal enuresis is a symptom not frequently volunteered by adult women and the pathogenesis of this condition in this age group is unclear.

Normal function during the voiding phase of micturition

Normal voiding:

Voiding is under voluntary control and is initiated by relaxation of the urethral sphincter followed by a rise in intravesical pressure. The relaxation of the urethra and contraction of the detrusor is co-ordinated by the complex neural mechanisms previously detailed. Contraction of the detrusor is maintained until the bladder is empty. In women, however, normal voiding may occur without an increase in intravesical pressure. Normal voiding results in complete emptying of the bladder with a normal flow rate in combination with low intravesical pressure. Residual urine is defined as the volume of fluid remaining in the bladder immediately following the completion of micturition (Bates et al 1980).

Voiding dysfunction:

A poor urinary stream can have a number of causes relating to detrusor or urethral function. Functional abnormalities of voiding can be investigated and interpreted using pressure/flow studies. Voiding dysfunction can occur as a result of detrusor underactivity, resulting in low pressure/low flow voiding as measured during urodynamics. If the detrusor does not contract during voiding it is termed acontractile. Bladder outlet obstruction gives a contrasting picture with urodynamics. A low flow rate, in combination with high intravesical pressure, indicates outflow obstruction. Bladder outflow obstruction in women can be secondary to urethral stricture or kinking of the urethra, secondary to a cystocele. Functional obstruction can occur if the urethral sphincter fails to relax adequately during voiding. Any of these voiding abnormalities can result in a poor urinary stream and incomplete voiding.

Voiding symptoms:

Symptoms commonly associated with dysfunction of the voiding phase of the micturition cycle are changes in the quality of the urinary stream and a feeling of incomplete emptying. These symptoms are more commonly described in men (Jolleys et al 1993) and are perceived as being related to bladder outlet obstruction. A recent study comparing voiding symptoms and urodynamic studies in men did not, however, find a strong correlation between symptoms relating to changes in the quality of the urinary stream and urodynamically proven obstruction (de la Rosette et al 1998). It is not known whether the same is true for women.

A recent study using the International Prostatic Symptom Score questionnaire in a small population of women found that the mean score for each question relating to voiding difficulties was less than one. This symptom score means that a symptom is never, or only rarely, present (Desgrandchamps et al 1996), apparently confirming the perception that these symptoms are rare in women. In contrast Jolleys et al, in a larger study of women in the community (1993), found that 8% of women described poor stream. It is

acknowledged that about 16% of patients referred to gynaecological clinics have symptoms suggestive of voiding dysfunction (Stanton, Ozsoy and Hilton 1983).

Obstruction does not appear to be a common cause of voiding dysfunction in women. Massey, in a review of the urodynamic diagnosis of obstructed voiding in women, found only 2.74% of women with voiding symptoms to be obstructed (Massey and Abrams 1988).

Detrusor underactivity is a more common cause of voiding dysfunction in women, particularly with increasing age. The complaint of poor stream becomes more common with increasing age and appears to be secondary to age-related changes in the detrusor which result in impaired contractility and therefore inefficient voiding (Elbadawi 1991; Elbadawi, Yalla and Resnick 1993a; Resnick and Yalla 1987).

Patients with neuropathic bladders will sometimes have voiding problems secondary to detrusor/sphincter dyssynergia or sphincter overactivity.

Retention of urine and associated difficulties have been described in younger women whose urethral sphincter does not appear to relax normally. This syndrome has been named "Fowler's syndrome" and is characterised by chronic repetitive discharges recorded with needle EMG which have a distinctive sound similar to that of whales (Fowler et al 1988).

In conclusion, existing data indicate that voiding symptoms are less common in women than men and are more commonly due to detrusor underactivity than obstruction.

The effect of ageing on lower urinary tract symptoms in women

It is well recognised that urinary symptoms in women, including incontinence, become more common with increasing age (Herzog and Fultz 1990; Diokno et al 1986; Resnick 1987; Ouslander 1997; Stenberg et al 1996). Hence, urinary symptoms in the elderly will become an increasing problem with the increasing age of the population

(McGrother et al 1987a; Fultz and Herzog 1996; Robinson 1997). The increasing prevalence of urinary symptoms with age is probably multifactorial and not related solely to pathology of the lower urinary tract (Gardner and Fonda 1994). The presence of contributory factors such as poor mobility (Resnick 1990; Sherman and Umlauf 1993) should be borne in mind when investigating the incontinent older woman, although urodynamic investigations (qv) still have a valuable role to play in the management of urinary symptoms in this age group (Eastwood 1979; Resnick and Yalla 1985; DuBeau and Resnick 1991). The pathophysiology of individual symptoms is discussed separately (qv). There are some general effects of ageing, however, that contribute to the increased prevalence of urgency, incontinence and voiding symptoms in the elderly.

The urethral sphincter pressure is known to decrease with increasing age in women (Sørensen et al 1991), which may contribute to the acknowledged increase in prevalence of incontinence with age (Thomas et al 1980; Brocklehurst 1993). The effects of decreasing oestrogen on the soft tissues of the lower urinary tract and detrusor muscle cell degeneration may play a role in the aetiology of incontinence as already discussed (Brown 1977).

It has been documented that degenerative changes occur in the detrusor muscle with age. These changes have been classified by Elbadawi with the aid of the electron microscope, and specific morphological changes have been correlated with specific diagnoses. Urodynamically proven detrusor instability has been characterised by a distinctive pattern of dysjunction with the loss of normal muscle cell junctions and the appearance of abnormal junctions, while detrusor muscle exhibiting impaired contractility was characterised by a degeneration pattern with disruptive degeneration of muscle cells and intrinsic axons (Elbadawi, Yalla and Resnick 1993a, Elbadawi, Yalla and Resnick 1993b). These changes correlate with a specific condition which is recognised in elderly women as "detrusor hyperactivity with impaired contractility" (Resnick and Yalla 1987). This describes older women who have a combination of storage symptoms and voiding difficulties.

Urinary tract infections in elderly women

Bacteriuria has been commonly described as occurring more frequently in elderly women, particularly those with impaired functional status (Brocklehurst et al 1972; Boscia et al 1986; Molander 1993) although, in contrast, one study of dysuria among women in the general population reported a history of urinary tract infection as being more common among younger women (Jolleys 1990).

Urinary tract infections can contribute to lower urinary tract symptomatology, although it is not clear whether this is true for this age group. Ouslander et al, in a study of urinary dysfunction in a geriatric outpatient population (1986), found that bacteriuria and pyuria were no more common among incontinent than continent patients.
Other studies have yielded similar results, Milne et al, in a large community study of the elderly in Scotland (1972), found bacteriuria to be relatively common in women, in 11.5% women and 2.8% men aged over 62 years, but found no clear relationship between bacteriuria and current urinary symptoms. Brocklehurst et al in a population study (1971) found that urinary tract infection, defined as bacteriuria >100,000 per ml, was common in older women and found that it was related to difficulty in passing urine in women, but had no other symptoms. They also found that bacteriuria was positively related to the presence of leucocytes in urine.

It is thus acknowledged that urinary tract infections are common in older women, although their exact contribution to lower urinary tract symptomatology is unclear.

The contribution of other medical conditions to the aetiology of incontinence:

Although specific changes associated with ageing affect the lower urinary tract resulting in urinary symptoms, other organs, for example the kidneys and brain, are also affected by the ageing process and contribute to the increase in lower urinary tract dysfunction

observed in older women (Resnick 1987; Ouslander 1997). The concentrating abilities of the glomerulus decline with age (Lubran 1995), which results in the production of large amounts of urine overnight and therefore nocturia. Ageing changes in the brain can result in cognitive impairment. The combination of cognitive impairment and decreased mobility that result in incontinence have been termed "functional incontinence" although, in practice, there is normally some form of lower urinary tract dysfunction associated with incontinence in the elderly (Elbadawi, Diokno and Millard 1998). Functional impairment can therefore be considered as a contributor to, rather than the sole cause of, incontinence in elderly women (DuBeau 1995).

Other medical conditions that can influence lower urinary tract function, for example diabetes and cerebrovascular accidents, are more common in the elderly and contribute to geriatric lower urinary tract dysfunction (Williams and Pannill 1982; McGrother et al 1998). The use of medication increases with age and concurrent medication can affect lower urinary tract function. Alpha blockers used in the management of hypertension may cause stress incontinence, and are one example (Thien et al 1978).

In conclusion, many urinary symptoms become increasingly common with age in women. There are several causes for this, including the effects of ageing on the lower urinary tract and other organs, which may influence lower urinary tract function. Pharmacological treatments used more often in the elderly may also adversely affect lower urinary tract function.

Urodynamic Investigations

Urodynamic investigations have an important role in the diagnosis of urinary symptoms, particularly urgency, urge and stress leakage, and voiding disorders. These should be undertaken whenever it is thought that the results will influence patient management (Byrne, Hamilton Stewart and Gray 1987; Swami and Abrams 1994; Resnick et al 1996).

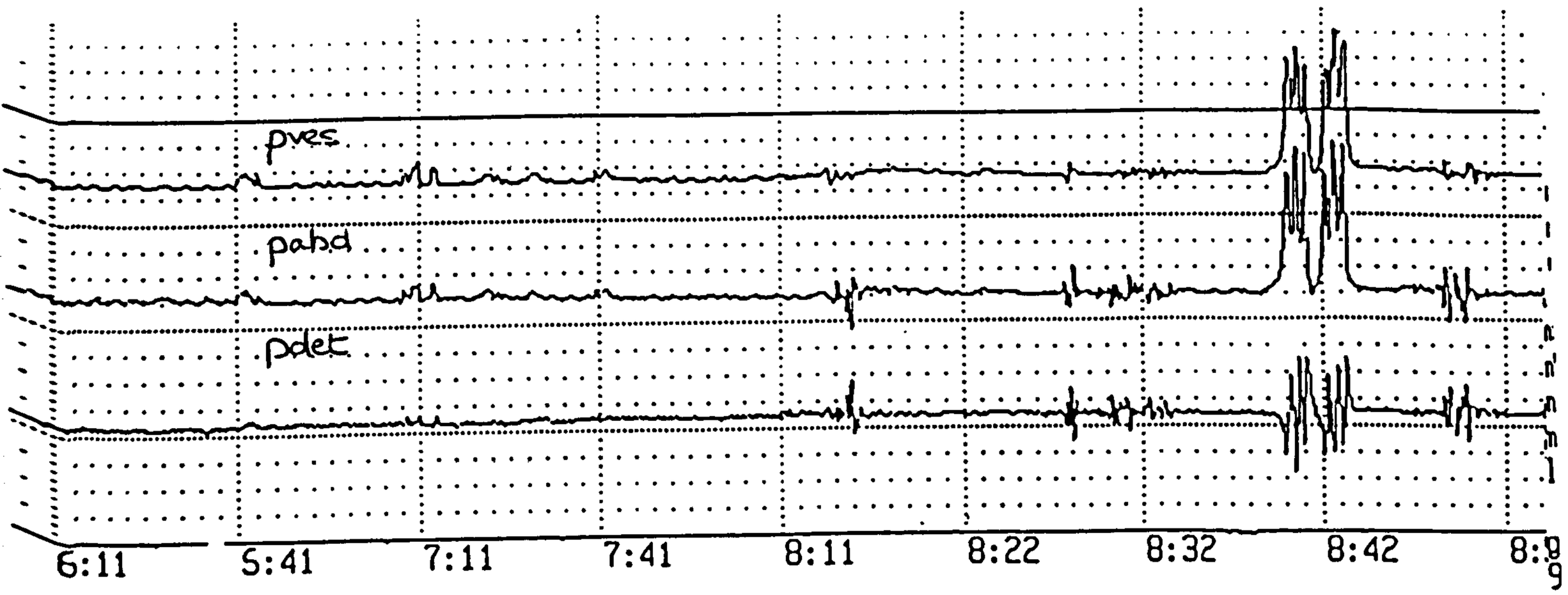
The main aims of urodynamics are to reproduce, and therefore explain, symptoms of lower urinary tract dysfunction and to provide a pathophysiological explanation for them (Abrams 1997).

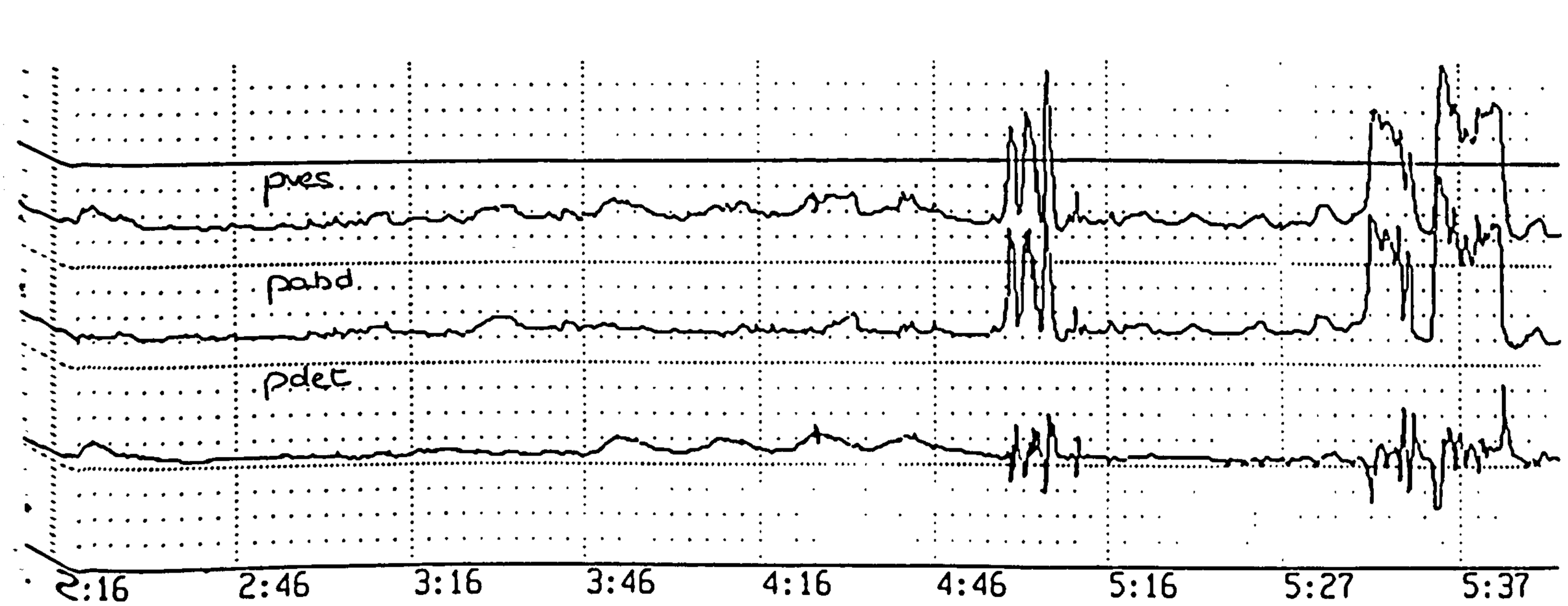
This is achieved through the use of pressure measurements from the bladder, abdomen (rectum or vagina) and, in some cases, urethra, during both storage and voiding (Brubaker and Sand 1990). Urodynamic investigations include uroflowmetry, urethral pressure measurements, cystometry, ambulatory monitoring and neurophysiological tests.

Filling cystometry enables the diagnoses of genuine stress incontinence and detrusor instability to be made categorically (Pearson and Noe 1979). Figure 1.2 shows cystometric traces illustrating both a stable bladder and detrusor instability.

Voiding cystometry provides important information about detrusor function during the voiding phase and enables the accurate diagnosis of the cause of voiding dysfunction. Urodynamic investigations are thus vital in the accurate diagnosis of lower urinary tract symptomatology and are important in the management of symptomatic women.

Figure 1.2. Cystometrograms illustrating both a stable bladder and detrusor instability. (Unstable waves are marked by arrows)





CHAPTER 2

THE PREVALENCE AND SOCIO-ECONOMIC IMPLICATIONS OF URINARY SYMPTOMS IN WOMEN

The prevalence of urinary symptoms in women

Review of the methodology used in prevalence studies:

The prevalence of any condition corresponds to its rate of occurrence and can be defined as the number of total cases at a certain point in time (Hampel et al 1997). For example, the prevalence of urinary incontinence can be defined as the probability of being incontinent within a defined population group at a specified time (Diokno 1995). There have been many studies assessing the prevalence of incontinence in women (Hampel et al 1997), but relatively few have addressed other urinary symptoms. Comparison between prevalence studies of incontinence has proved difficult owing to the lack of a standardised definition of incontinence, the use of some biased populations and unvalidated questionnaires.

Urinary incontinence is the involuntary leakage of urine. The International Continence Society have defined this further as "a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable" (Bates et al 1976). This definition has, however, rarely been used in prevalence studies, possibly due to the difficulty of defining what would constitute a social or hygienic problem and the practical difficulty in demonstrating incontinence in population studies. The prevalence of incontinence is most commonly defined by the frequency with which incontinent episodes occur, although there is no consensus in the literature about how frequently leakage has to occur to constitute incontinence.

Thomas et al, in a large prevalence study of community-dwelling men and women (1980), defined incontinence as leakage of urine occurring at least twice a month. This definition has been used in other studies (Lagro-Janssen, Smits and van Weel 1990; O'Brien et al 1991), while alternative definitions applied include leakage occurring at

least once (Peet, Castleden and McGrother 1995) or twice a week (Kok et al 1992), at least once in the preceding month (Jolleys et al 1993), at least once in two months (Diokno et al 1986; Brocklehurst 1993), at least once in six months (Teasdale et al 1988), or at least once in the preceding year (Yarnell and St Leger 1979) or, more commonly, any leakage experienced at the time of the study (Brocklehurst et al 1971; Brocklehurst et al 1972; Iosif, Henriksson and Ulmsten 1981; Jolleys 1988; Hellstrom et al 1990; Burgio, Matthews and Engel 1991; Milsom et al 1993; Harrison and Memel 1994; McGrother et al 1998). While some studies have used community-dwelling populations where published prevalences may represent those of the general population (Thomas et al 1980; Jolleys 1988; O'Brien et al 1991; Brocklehurst 1993; Harrison and Memel 1994), others have involved selected populations, with their inherent bias, chosen either by occupation (Nemir and Middleton 1954; Wolin 1969), opportunistic sampling during family doctor visits (Simeonova and Bengtsson 1990), participation in unrelated studies (Burgio, Matthews and Engel 1991) or attendance at summer school for an association of elderly people (Teasdale et al 1988). Prevalences in specified populations, such as institutionalised women (Peet, Castleden and McGrother 1995; Ouslander et al 1993), or specific age groups (Brocklehurst et al 1971; Brocklehurst et al 1972; Yarnell and St Leger 1979; Diokno et al 1986; McGrother et al 1987b; Teasdale et al 1988; Foldspang et al 1992; Milsom et al 1993) have also been estimated.

The methodology used varied, with some studies using interviews (Vetter, Jones and Victor 1981; Diokno et al 1986; Lagro-Janssen, Smits and van Weel 1990; Brocklehurst 1993) and others self-completed questionnaires (Thomas et al 1980; O'Brien et al 1991; Jolleys et al 1993; Harrison and Memel 1994), although few of the questionnaires employed have been validated.

The prevalence of incontinence in any study depends on the characteristics of the responders and often little information is given in published studies about non-responders. Response rates are not stated in all studies of incontinence but, where stated, they range from 44.2 to 98% (Brocklehurst et al 1972; Yarnell and St Leger 1979). Age has been shown to affect response rates with lower response rates cited for both younger and older women (Molander 1993). The highest response rates are often achieved among those in the menopausal age range (Milsom et al 1993). It is often

stated that symptomatic women will be over-represented among the responders. However Sandvik and Hunskaar (1994), in a study looking at pad usage among women known to be incontinent, achieved only a low response rate of 50%. This low response rate was felt by the authors to indicate that in contrast to the widely held belief that incontinent women will form a greater percentage of responders than non-responders, the reverse may in fact be true. This is only one study, but it further emphasises the fact that, where the response rate is poor, it is difficult to make any assumptions about the prevalence of incontinence among non-responders. Studies with poor response rates need therefore to be interpreted with caution.

Validation of responses in prevalence studies:

As discussed, a variety of questionnaires have been used with few studies employing questionnaires that have been subjected to psychometric testing, although there are now a small number of validated self-completion questionnaires available, for example the Urogenital Distress Inventory (Shumaker et al 1994), and the Bristol Female Lower Urinary Tract Symptoms questionnaire (Jackson et al 1996).

Although few studies have employed questionnaires that have been subjected to vigorous psychometric testing, some studies have attempted to validate the respondents' answers. This has been achieved by either contacting symptomatic people to verify their answers (Thomas et al 1980; Jolleys 1988; O'Brien et al 1991) or by attempting to objectively confirm the presence of incontinence in women admitting to incontinence. Objective confirmation of incontinence has been performed either through pad tests on symptomatic women (Hellstrom L et al 1990; Molander et al 1990; Milsom et al 1993), or urodynamic studies (McGrother et al 1987b).

The prevalence of incontinence

The majority of prevalence studies concerning incontinence in women describe the prevalence of incontinence as a whole and have been conducted among caucasian

populations (Hunskaar et al 1999). However some studies have attempted to differentiate between the various types of diurnal incontinence, for example stress and urge incontinence, and the prevalences of these different types have been reported separately.

Those studies that describe the prevalence of different types of incontinence either express their prevalences as a percentage of the total number of incontinent women (Holst and Wilson 1988; Simeonova and Bengtsson 1990; O'Brien et al 1991; Harrison and Memel 1994), or as a percentage of the total number of respondent women in the study (Iosif, Henriksson and Ulmsten 1981; Yarnell et al 1981; Sommer et al 1990; Samuelsson, Victor and Tibblin 1997). Stress incontinence is described as the most common form of incontinence in all of these studies, apart from that of Iosif et al (1981). Mixed stress and urge incontinence is the next most common, and urge incontinence the least common type. It has been suggested that mixed incontinence may be over-reported with most patients having simple stress incontinence (Payne 1998). The percentage of incontinent women with stress incontinence is reported as 37-55%, mixed incontinence 22-43%, and urge incontinence 8-29% (Holst and Wilson 1988; Simeonova and Bengtsson 1990; O'Brien et al 1991; Harrison and Memel 1994).

The prevalence of nocturnal enuresis, defined as the involuntary discharge of urine by night at an age when bladder control is expected, has been reported infrequently in adult women with quoted percentages ranging from 1.5-4% (Teasdale et al 1988; Jolleys et al 1993; Brieger et al 1996; Burgio et al 1996).

In view of the lack of agreed definitions, study designs and populations studied, published prevalences of incontinence in women vary considerably ranging from 8.5-57% (Thomas et al 1980; Brocklehurst et al 1972). Some studies of incontinence have looked further than pure occurrence and have described correlations between incontinence and for example surgery, such as hysterectomy, or parity.

The relationship between hysterectomy and incontinence does not appear to be clearly defined with Milsom et al (1993) reporting an increased prevalence of incontinence after hysterectomy of 20.8%, compared with 16.4% in controls, a result confirmed in a study

by Lagro-Janssen, Smits and van Weel (1990), while others have found no such relationship (Jolleys 1988; Iosif, Bekassy and Rydhstrom 1988; Harrison and Memel 1994).

All studies including data on parity and incontinence have found a positive relationship between these two variables (Glenning 1985; Holst and Wilson 1988; Foldspang et al 1992; Harrison and Memel 1994). Milsom et al (1993) found that the greatest increase in the prevalence of incontinence occurred after the birth of the first child.

There are clearly a large number of studies describing the prevalence of incontinence in terms of occurrence. Tables 2.1, 2.2, 2.3 and 2.4 summarise the methodology and prevalences reported in a number of published studies.

Pad usage among incontinent women:

One method employed to assess the severity or hygienic impact of incontinence in women is to determine the frequency of pad usage, and a number of the studies that examine the prevalence of urinary incontinence or its impact on quality of life also describe pad usage (Feneley et al 1979; Jolleys 1988; O'Brien et al 1991; Harrison and Memel 1994).

The wearing of pads is one of the most common methods employed by women to control their incontinence, and a greater proportion of incontinent women than men use pads (Herzog et al 1989). Pad usage, although common, is not without associated morbidity, for example, skin irritation is often described by pad users (Klemm and Creason 1991).

Estimating the extent of pad usage is not easy, as many women use home-made pads derived from toilet paper or towels rather than manufactured pads (Sandvik, Kveine and Hunskaar 1993; Brink, Wells and Diokno 1987), and some incontinent women only use pads for exercise (Jolleys 1988). Designing questionnaires that can accurately determine the prevalence of pad usage and include all the variations of pad usage

therefore requires careful thought. The prevalence of pad usage is most commonly expressed as a percentage of all incontinent women in the study (Feneley et al 1979; Burgio, Matthews and Engel 1991; Harrison and Memel 1994), with some studies describing pad usage as a proportion of the population (Sandvik and Hunskaar 1993). The percentage of incontinent women who wear pads ranges from 13% to 67.9% (Hellstrom L et al 1990; Harrison and Memel 1994) with the majority of studies reporting figures of between 31-38% (Feneley et al 1979; Diokno et al 1986; Molander et al 1990; Simeonova and Bengtsson 1990; Burgio, Matthews and Engel 1991). When pad usage is expressed as a percentage of the study population, figures of 1.6%-8% are given (Sandvik and Hunskaar 1993; Sommer et al 1990). The prevalence of pad usage has been shown to increase with age (Molander et al 1990, Sommer et al 1990) and is very common among the institutionalised elderly with one study of 85 year old men and women in Göteborg describing pad usage in 91.5% of the women living in institutions (Hellstrom L et al 1990). Indeed the wearing of pads seems to be a common method of managing incontinence in residential homes (Starer and Libow 1985).

Some prevalence studies have used the necessity of pad wearing as a method of grading the severity of incontinence (Thomas et al 1980; Norton 1982). The severity and frequency of episodes of incontinence does appear to be related to pad use (Vetter, Jones and Victor 1981; Rekers et al 1992a), although one Scandinavian study found no correlations between the type of pad used and the degree or duration of incontinence (Sandvik, Kveine and Hunskaar 1993).

In some countries the majority of pads used for incontinence are supplied by insurance services (Sandvik and Hunskaar 1993), while in the United Kingdom a study, by McGrother et al (1987b) investigating the services supplied to the incontinent elderly, found that 31% of incontinent women used pads supplied by the National Health Service while 22% of the elderly supplied their own and 47% used no pads.

Relationship between prevalence of incontinence and age:

There is a general consensus in the literature that the prevalence of incontinence increases with age (Thomas et al 1980; Brocklehurst 1993). Incontinence is less commonly reported among younger women. Brocklehurst (1993) found that the prevalence of incontinence occurring at least once every two months increased in a linear fashion from 5.4% at 30-49 years to 10.2% in women aged 60 years and over. Other authors have found that the prevalence of incontinence rises to a peak at around the time of the menopause with a postmenopausal decrease in prevalence (Foldspang et al 1992; Burgio, Matthews and Engel 1991; Jolleys 1988). Although incontinence may be more common in middle age it may take a less severe form than in older women. Sandvik and Hunskaar (1994) found in a study of pad usage among women aged 20 to 89 years that pad usage was less frequent among women aged 40 to 79 years than in either older or younger women, possibly reflecting the relative severity of incontinence at these ages. Incontinence in the elderly has been found to be relatively common, with prevalences of between 20% and 43.2% quoted for women aged 80 years and over (Rekers et al 1992a; Kok et al 1992; Campbell, Reinken and McCosh 1985; Hellstrom L et al 1990).

In view of the role that incontinence is recognised as playing in the institutionalisation of the elderly, it is not surprising that incontinence is more common among institutionalised elderly women than among elderly women in the community, Ouslander, Kane and Abrass found in a study of seven nursing homes in the USA (1982) that 50% of elderly patients were incontinent of urine. In a further study of urinary incontinence in nursing homes a positive relationship was reported between dementia and incontinence (Ouslander et al 1993).

Tables 2.1 and 2.2. Summary of prevalence studies of women in the community. Key to the following tables: m=male f=female current incontinence: incontinence reported at the time of the study among women, unless otherwise stated

Table2.1.

Author	Prevalence	Population	Definition of incontinence	Age range	Sample size	Method
Brocklehurst 1971	23%	GP practice patients (m and f)	current incontinence	>65 years	557 (m and f)	nurse interview
Brocklehurst 1972	57%	GP practice patients (f)	current incontinence	45-64 years	453 (f)	nurse interview
Feneley 1979	8%	GP practice patients (m and f)	>2 times a month	>5 years	@7,000 (m and f)	postal questionnaire
Yarnell 1979	17%	random sample GP patients (m and f)	any during previous year	>65 years	388 (m and f)	interview by authors
Thomas 1980	8.5% (15-64 yrs)	GP practice patients (m and f)	>2 times a month	>5 years	18084 (m and f)	postal questionnaire
Vetter 1981	18.1%	random sample from 2 GP practices (m and f)	current incontinence	>70 years	1280 (m and f)	structured interview
Yarnell 1981	45%	random sample women from electoral register	year prior to study	>18 years	1060 (f)	questionnaire interview
Iosif 1984	29.2%	random sample from area of Sweden	current incontinence	61 years	902 women	postal questionnaire
Campbell 1985	18% (65-74 yrs)	random sample of elderly (m and f)	current incontinence	>65 years	559 (m and f)	interview by medical examiner
Diokno 1986	37.7%	multistage probability sample (m and f)	6 times in previous year	>60 years	1955 (m and f)	structured interview
Hørding 1986	22%	epidemiological health survey (f)	current incontinence	45 years	515 (f)	interview by authors
McGrother 1987b	6.5% major incontinence	sample from previous survey (m and f)	wetting of clothes	>75 years	1097 (m and f)	structured interview
Jolleys 1988	41%	GP practice patients (f)	current incontinence	>25 years or >21 yrs on oralcontraceptive	833 (f)	postal questionnaire
Holst 1988	17%	random sample from electoral register (f)	>2 times a month	>18 years	851 (f)	telephone interview
Elving 1989	17.1%	random sample women	any during previous year	30-59 years	2631 (f)	postal questionnaire

Table 2.2.

Author	Prevalence	Population	Definition of incontinence	Age range	Sample size	Method
Hellstrom 1990	43.2%	all men and women in one area	current incontinence	>85 years	974 (m and f)	interview at clinic
Sommer 1990	40.1%	random sample from age/sex register (f)	any incontinence	20-79 years	414 (f)	postal questionnaire
Molander 1990	16.9%	random sample from area (f)	current incontinence	65-84 years	4206 (f)	postal questionnaire
O'Brien 1991	16.3%	random sample 2 GP practices (m and f)	>2 times a month	>35 years	5661 (m and f)	postal questionnaire
Kok 1992	23.5%	random sample from area (f)	>2 times a week	>60 years	719 (f)	postal questionnaire
Rekers 1992a	26.5%	stratified sample of women in area	current incontinence	35-79 years	1299 (f)	postal questionnaire
Brocklehurst 1993	7.5%	random sample of population (m and f)	any in previous two months	>30 years	4007 (m and f)	interview (MORI poll)
Jolleys 1993	38% urge 48% stress	GP practice patients (m and f)	any in previous month	>40 years	640 (f)	postal questionnaire
Milsom 1993	12.1-24.6%	random sample women from birth cohorts	current incontinence	46-86 years	7459 (f)	postal questionnaire
Harrison 1994	53%	random sample of women from GP practice	current incontinence	>20 years	314 (f)	postal questionnaire

Table 2.3. Summary of prevalence studies among specific populations of women.

Author	Prevalence	Population	Definition of incontinence	Age range	Sample size	Method
Nemir 1954	52.4%	freshmen at university (f)	any current stress incontinence	17-21 years	1327 (f)	self-completed questionnaire
Wolin 1969	50.7%	nulliparous nurses (f)	any current stress incontinence	17-25 years	4211 (f)	self completed questionnaire
Crist 1972	34%	random sample of hospital personnel (f)	any current incontinence	16-63 years	1008 (f)	self-completed questionnaire
Glenning 1985	31.6%	hospital workers or mothers attending paediatric clinic (f)	any current incontinence	>20 years	886 (f)	self completed questionnaire
Mohide 1988	22% (male and female)	patients receiving home care services (m and f)	any incontinence on one specific day when study undertaken	18-101 years	2801 (m and f)	structured questionnaire health workers
Iosif 1988	41%	hysterectomised or sterilised women	any current incontinence	29-52 years	750 (f)	postal questionnaire
Teasdale 1988	37.2%	attenders at summer meeting for retired people (m and f)	> once in previous 6 months	65-85 years	599 (m and f)	self completed questionnaire
Lagro-Janssen 1990	22.5%	women in health survey	any current incontinence	50-65 years	1442 (f)	interview
Simeonova 1990	44%	women attending family doctor in one month period	any current incontinence	>18 years	451 (f)	self completed questionnaire
Burgio 1991	58%	women in cardiovascular study	any current incontinence	42-50 years	541 (f)	structured nurse interview
Samuelsson 1997	27.7%	women attending health check	any current incontinence	20-59 years	491 (f)	postal questionnaire

Table 2.4. Summary of prevalence studies of institutionalised women.

Author	Prevalence	Population	Definition of incontinence	Age range	Sample size	Method
Ouslander 1982	50% (m and f)	nursing home residents (m and f)	current incontinence	>65 years	954 (m and f)	nurse reports
Starer 1985	62.4% (m and f)	nursing home residents (m and f)	current incontinence	elderly (mean 85 years)	511 (m and f)	nurse reports
Ouslander 1993	39%	nursing home residents (m and f)	current incontinence	>65 years	430 (m and f)	nurse reports
Peet 1995	22.7% (m and f)	long-term care residents men and women	>once a week	>65 years	5758 (m and f)	census of institutions

The prevalence of urinary symptoms

Although the prevalence of incontinence has been widely reported, albeit with the limitations already discussed, the prevalence of other urinary symptoms among women has been studied far less frequently. Those urinary symptoms that have been studied include urgency, diurnal frequency, nocturia and voiding difficulties. The prevalence of these symptoms have sometimes been cited solely in relation to incontinence (Diokno et al 1986; Kok et al 1992).

Nocturia:

Nocturia, the voiding of urine during the night (Barker and Mitteness 1988), is usually only regarded as abnormal if voiding occurs more than once a night (Hilton and Stanton 1982). Nocturia is consistently reported in the literature as increasing in prevalence in a linear fashion with increasing age (Brocklehurst et al 1971; Brocklehurst et al 1972; Diokno et al 1986; Kok et al 1992; Samuelsson, Victor and Tibblin 1997). Prevalences cited range from 2% in those aged 20-39 years (Glenning 1985) to 17.6% in postmenopausal women (Rekers et al 1992b). Nocturia has been described as showing a positive relationship with self-reported coexisting incontinence (Diokno et al 1986).

Urinary Frequency:

Most authors have regarded voiding frequencies of less than 3-hourly as abnormal (Glenning 1985) and therefore diurnal frequency can be defined as voiding at intervals of less than 3 hours, or 8 or more times in 24 hours. This definition has been drawn from data from studies involving frequency/volume charts which showed that 90% of women voided between 3 and 6 hourly (Glenning 1985), or 5 to 7 times a day (Sommer et al 1990). Rekers et al (1992b) found that 17.1% of premenopausal women voided more than 6 times a day compared to 19.6% of postmenopausal women, while Brocklehurst et al in two studies of dysuria in women reported urinary frequency of

more than two hourly in 21% of women (1971; 1972). Jolleys et al (1993) reported that 16% of women aged 40 years and over admitted to urinary frequency. In this study no definition of frequency was given.

Urgency:

Urgency, defined as the urgent desire to void for fear of leakage, has been reported in between 9.4% of women aged 20 to 59 years (Glenning 1985) and 39.6% of women aged 20 to 79 years (Sommer et al 1990). Kok et al (1992) found a relationship between incontinence and urgency with prevalences of urgency of 7.1% in all women, compared with 21.6% in incontinent women aged 60 to 84 years. Rekers et al (1992b) found that urgency was more common in postmenopausal (14.9%) than premenopausal (8.7%) women.

Poor stream:

In women, voiding dysfunction is perceived less commonly as an important urinary symptom, in spite of evidence that detrusor function may become less efficient with age (Elbadawi, Yalla and Resnick 1993a). Diokno et al (1986) described 10.8% of women aged 60 years and over as having a poor stream, while Teasdale et al (1988) reported this in 18% of women aged 65 years and over and Brocklehurst et al (1971) in 8% of women aged over 81 years. In contrast to these studies McGrother et al (1987b) found that no women in their study described voiding difficulties. There is no obvious explanation from the methodology used to explain this finding.

Conclusions:

As can be seen from reviewing the literature concerning the prevalence of lower urinary tract symptoms in women, there is an abundance of data concerning incontinence. However there is a lack of information concerning the prevalence of other urinary

symptoms. There has been little attempt to validate the results obtained, with the vast majority of prevalence studies using neither validated instruments nor investigating symptomatic women to verify their answers. There exists therefore a paucity of information concerning the prevalence of urinary symptoms in women, including incontinence, in the general population measured with a validated instrument.

The discrepancy between reported urinary symptoms and the number of women who seek treatment

A significant proportion of women admit to having urinary symptoms, including incontinence, when directly questioned. However, there is a well-recognised discrepancy between the prevalences of urinary incontinence reported in population studies, and the number of women who seek treatment. This also appears to be true for urinary symptoms.

Feneley et al (1979) conducted a study which looked at both the number of people who admitted to incontinence on direct questioning, termed "unrecognised incontinence", and the number who were known to health care professionals to be incontinent, termed "recognised incontinence". The information concerning recognised incontinence was gathered from general practitioners, community nurses, nursing homes and social services, while the information about unrecognised incontinence was derived from a postal questionnaire survey. The overall prevalence of unrecognised incontinence was 8% for women and 3% for men, contrasting with a prevalence figure of 1% for recognised incontinence in both men and women. Attempts have been made to investigate this apparent discrepancy in order to quantify the number of women who may need treatment and to address any issues that may be preventing them from seeking treatment. Harrison and Memel (1994) conducted a prevalence study among women in the community determining both the prevalence of incontinence and the feasibility of setting up a health promotion clinic to treat incontinence. The health promotion clinic was designed to encourage women to come forward for treatment. The overall prevalence of incontinence in the study was 53%, with 35% of incontinent women finding their incontinence troublesome and only 13% having consulted their doctor

about their incontinence. All incontinent women were then offered an appointment at a women's clinic, but only 13 of the 167 (8%) incontinent women attended. The authors felt that the poor uptake of the clinic, which occurred in spite of attempts to make it as acceptable to women as possible, may illustrate the psychological barrier that exists between having a condition and actively seeking treatment for it. In a similar study in New Zealand, Holst and Wilson (1988) found that a similar percentage of incontinent women (35%) had sought medical help for their incontinence. Women who did not seek help were asked to give reasons for this. The commonest reason given was that incontinence was not perceived as abnormal. Other reasons given for not seeking treatment were poor expectation of treatment benefit, ignorance of treatment options, incontinence was felt to be related to other medical conditions and the potential cost of treatment. The figure given for the proportion of incontinent women who do not seek treatment is reflected elsewhere in the literature, with percentages of symptomatic women seeking treatment given at between 35% (Lagro-Janssen, Smits and van Weel 1990) and 50% (Yarnell et al 1981; Brocklehurst 1993). Fear of surgery has been listed as an additional reason for not seeking medical advice (Jolleys 1988; Norton et al 1988).

Brocklehurst (1993), in addition, noted an age difference in those who sought treatment, with a greater proportion of younger women seeking treatment. 55% of men and women aged 30-59 years sought treatment compared with 49% aged 60 years and over. The statistical significance of this was not stated. Norton et al (1988) also found the elderly to be the most reluctant in seeking advice, with 39% of incontinent women aged over 65 years waiting more than five years to seek advice compared with 20% of women under 35 years waiting more than five years. The needs of the incontinent elderly should be particularly borne in mind when information is disseminated about incontinence, as this group of women appears to be peculiarly vulnerable due to a combination of reluctance to seek help, social isolation and embarrassment about their incontinence (McGrother et al 1987a).

Attempts to address the needs of incontinent people who do not present for medical advice have not always been met with success. O'Brien et al (1991) found that only 378 of a total of 700 (54%) incontinent patients in two general practices enrolled for a

treatment programme when invited to do so, suggesting that not all incontinent women desired treatment. Flexibility with clinic times and geographical location did not alter the uptake. The need for health care provision is clearly related to the number of people desiring treatment, rather than simply to the number who are symptomatic.

There is a need to quantify any unmet need further by estimating the number of women who are not only symptomatic, but also troubled by their symptoms. This concept of associated perceived trouble or "bother", as it has sometimes been termed, was first included in questionnaires relating to lower urinary tract symptoms in men (Hald et al 1991; Barry et al 1992), where it was used to aid the targeting of health care. Indeed it is not always the most common symptoms that are the most troublesome. Jolleys et al (1994), in a study of urinary symptoms in men, found that although voiding symptoms, such as poor stream and hesitancy, were relatively common, it was storage symptoms, such as urge incontinence, that caused the most distress to sufferers. In a study addressing the prevalence of troublesome lower urinary tract symptoms in both men and women in Australia, using the AUA- 7 BPH questionnaire, it was found that women complained of more troublesome symptoms than men (Pinnock and Marshall 1997).

Clearly the estimation of the perceived troublesomeness of urinary symptoms could help to determine the need for health care provision for urinary symptoms including incontinence. The sufferer's perspective should, however, not be forgotten. Incontinence is perceived as a taboo subject by the general population, with a recent qualitative study highlighting the need for health care workers to help symptomatic women to verbalise their problems (Ashworth and Hagan 1993). Perhaps a different approach is required by the medical profession in order to help break down barriers and encourage women with troublesome incontinence, the elderly in particular, to come forward for treatment.

The economic implications of urinary symptoms

The cost of a condition can be viewed solely in monetary terms, or can be more broadly interpreted in terms of loss, which would include not only economic, but also physical

and psychosocial costs (Wyman 1997). The psychosocial costs of urinary incontinence will be considered later in this chapter. The economic impact of diseases is known to be an important factor in determining the distribution of resources within a health care system (Hu 1986). Various methods have been devised to take account of the cost implications of treating different conditions, including QALYs, or quality-adjusted life-years, which take account of the cost of treatment and subsequent increased life span and quality of life benefit. This particular measure was initially popular with health economists, but has recently declined in popularity (Burrows and Brown 1993). Apart from the recognised cost of hospitalisation of the elderly, secondary to falls caused by night-time toiletting (Stewart et al 1992), urinary incontinence is the only urinary symptom where economic impact has been studied in any depth. In recognition of the importance of cost in management decision-making, methods of determining cost-effectiveness have recently been evaluated to aid comparison of treatments for urge incontinence (Kobelt 1997).

Urinary incontinence is one of the most distressing conditions affecting elderly people and is recognised as involving extensive costs (Wells 1984). The economic impact of diseases includes both direct and indirect costs. Direct costs of urinary incontinence are those relating to diagnosis and treatment and comprise the cost of investigations, medication, surgery, pads, appliances, and nursing incontinent patients. Indirect costs include work absenteeism, secondary to urinary symptoms, and the loss of earnings of unpaid carers. The indirect cost of falls and pressure sores secondary to incontinence also need to be taken into account (Resnick and Yalla 1985).

Direct costs of incontinence

Few studies have attempted to evaluate all the economic implications of incontinence. However two studies (Hu 1986; Wagner and Hu 1998) outline in detail the economic factors that need to be taken into account when the cost of incontinence is considered. The direct costs of incontinence are those of investigating and treating a symptomatic patient.

The cost of investigating a patient complaining of urinary incontinence have been estimated as about $600 (Ouslander and Kane 1984). This figure includes consultation, laboratory tests, cystoscopy and urodynamic studies. A less extensive evaluation has been estimated at $600 for 1995 (Wagner and Hu 1998). Assuming that 316,000 individuals received some form of diagnostic evaluation, total cost of evaluating incontinence in the USA would have been about $389.8 million in 1995 (Wagner and Hu 1998).

The cost of surgery for stress incontinence has been estimated as $8342 per operation, or $613.8 million in 1995 (Wagner and Hu 1998).

Ouslander and Kane (Ouslander and Kane 1984) have estimated that the costs of medical treatment were $1 a day per patient, this gives an annual cost of $5.3 million for the medical treatment of incontinence in the United States in the 1980s. In 1995 the annual cost of drug treatments was estimated as $8.5 million (Wagner and Hu 1998). There is little information relating to the costs of incontinence in the United Kingdom, with information relating solely to the cost of prescription items, pads and appliances. The cost of these has been calculated as £68 million in 1986 (Royal College of Physicians 1995). The cost of pad deliveries for Southmead NHS Trust was £244,610 from April 1997 to March 1998 for a population of 280,000 (unpublished data). If this is extrapolated to the population of the United Kingdom of 58,801,000 (UK population estimate 1996), a figure of £51 million is found for the cost of pads alone. The cost to the individual is obviously much higher than this, as 95% of incontinent people purchase their own pads (O'Brien et al 1991).

The substantial costs of protective padding are reflected in other countries with the cost of protective padding in the United States estimated at between $36.50 a year, if one panty liner is used a day, to $365 a year, if five pads a day are used, (Brink, Wells and Diokno 1987). In a Swedish study, 1.6% of all women were found to have bought pads for incontinence in a three month period. Pad sales increased with age to 8.2%f all women over 70 years (Sandvik and Hunskaar 1993).

The cost of keeping someone in a nursing home is affected by the presence of incontinence, with an estimated increase in cost of between $2.90 and $11.09 a day for

incontinent patients due to the combined cost of extra nursing, pads and appliances (Ouslander and Kane 1984)

Incontinent men and women living at home have also been recognised as having increased consumption of home care services (Baker and Bice 1995).

Indirect costs of incontinence

Although the direct costs of incontinence are high, there is less information concerning indirect costs such as the amount of time lost from work secondary to urinary incontinence. Lam et al (1992) in a study of women aged 30-59 years found that 1% of women with incontinence had abstained from work as a result of urinary incontinence. This does not, however, appear to take account of the cost of treating incontinence, such as time spent away from work as a result of surgery for stress incontinence.

The cost of family members attending to incontinent relatives can be calculated as $1449 annually if an hourly rate of $4.60 is used to estimate the cost of replacing these carers with nursing aides (Hu 1986).

Taking all the above expense into account the total cost of incontinence in the United States has been estimated at between $2 (Hu 1986) and $10.3 billion (Consensus Conference 1989) in the 1980s. A more recent study has estimated the total cost of incontinence as $26.3 billion for the USA in 1995, and $3,565 for each individual with urinary incontinence (Wagner and Hu 1998).

Cost effectiveness of treating incontinence

The calculation of the economic impact of incontinence takes into account both the costs of a person remaining incontinent and treatment costs to achieve and maintain

continence. The comparative costs of active treatment of incontinence in nursing homes has been investigated in a study by Schnelle et al (1988) which compared staffing costs secondary to active toiletting with the cost of laundry and labour of changing sheets. They reported that the costs involved in toiletting patients regularly to maintain continence outweighed any savings from reduced amounts of laundry and changing patients. However they recognised that there are many benefits, such as improved quality of life, even if no direct cost saving benefits. In contrast, another study looking at the installation of a mechanical lift to aid toiletting of incontinent mobility-impaired long-term care residents found that this was cost-effective (McCormick et al 1990). This finding is important, as mobility impairment is recognised as contributing to incontinence (Ouslander, Kane and Abrass 1982; Ekelund and Rundgren 1987; Yu et al 1990), and indeed the mobility impaired are at particular risk of developing bedsores with consequent economic implications.

Incontinence is one of the most important factors in determining whether an elderly person is institutionalised and the potential savings in nursing home costs from promoting continence in the community must also be borne in mind (Ekelund and Rundgren 1987). This will become increasingly important with an ageing population (Anand et al 1990).

Incontinence can thus be seen to have a large economic impact on the individual and society involving both direct and indirect costs.

Effects of urinary symptoms on quality of life

The concept of "Quality of life"

Urinary symptoms, and incontinence in particular, frequently affect the lifestyle of sufferers with a negative effect on social, physical and sexual aspects of life (Brocklehurst 1993). The recognised discrepancy between the number of women who report urinary symptoms and the number who seek treatment has already been discussed. Some of this reluctance to seek treatment may be due either to the

perception of incontinence as a taboo subject hindering sufferers from admitting their problem to health care professionals (Ashworth and Hagan 1993), or else because incontinence has not had an impact on the daily life of an individual (Wyman 1994).

It is perhaps only when urinary symptoms impact significantly on an individual's daily routine that treatment will be sought and equally patients may only perceive themselves cured if their sense of well-being improves. The concept of "well-being" is an abstract one, but in recent years the term "quality of life" has evolved in an effort to define the impact of different diseases on an individual's lifestyle (MacDonagh 1996) and thereby to aid the targeting of health resources. The term "quality of life" has no universally agreed definition. The notion of quality of life is alluded to in the World Health Organisation's description of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1947). It is against this backdrop that clinicians measure quality of life in order to investigate further the effect that different conditions have on individuals and to determine where service improvements need to be made.

As quality of life is an abstract idea it can only be measured in terms of a sufferer's perception of their condition and the consequent restriction that it places on their life. Clearly the same condition may affect individuals differently, reflecting not only the severity of the condition, but also the influence of personality on how diseases are perceived (Kelleher, Cardozo and Toozs-Hobson 1995; Kelleher et al 1997). This needs to be borne in mind when reviewing data regarding quality of life. Nevertheless, quality of life is an important concept and there has been much interest in developing instruments to measure it.

As quality of life is a subjective measure, the instruments used to quantify it take the form of questionnaires and as such require validation to confirm their accuracy (Spitzer 1987).

The questionnaires used to estimate quality of life take the form of either generic or disease specific questionnaires. The quality of life questionnaires that have been used in studies relating to urinary symptoms will be discussed in more detail in Chapter 3. However, in general terms, generic questionnaires have the advantage of allowing

comparison between the impact of different diseases on quality of life. Disease specific questionnaires for urinary symptoms, such as the Incontinence Impact questionnaire (Wyman et al 1987), Symptom Impact Index (Black, Griffiths and Pope 1996) and King's Health questionnaire (Kelleher et al 1997), are felt to be more sensitive in detecting quality of life changes following treatment, in view of the pertinent questions they contain. They are, therefore, frequently used as outcome measures in therapeutic trials (Fantl et al 1991; Fonda et al 1995).

The impact of urinary incontinence on quality of life

As with most other prevalence studies relating to urinary symptoms, the bulk of the literature concerns the effect of incontinence on quality of life rather than other urinary symptoms. Some of the prevalence studies of incontinence already described in this chapter have made some attempt to measure the impact of incontinence on individuals. In a prevalence study of incontinence in the community, Brocklehurst (1993) found that 34% of women felt that their lifestyle had been considerably affected by their condition.

Many studies have been performed solely to investigate the impact of incontinence on quality of life. Published studies fall loosely into three categories, those that use generic questionnaires (Hunskaar and Vinsnes 1991; Kelleher, Khullar and Cardozo 1993; Grimby et al 1993), those that use disease specific questionnaires (Wyman et al 1987) and those that include some measure of quality of life in a general questionnaire (Norton et al 1988; Jackson et al 1999).

Regardless of the type of method used to measure quality of life impact, there is a consensus in the literature that incontinence does affect quality of life, causing social isolation. It is not surprising that incontinence should have a large impact on quality of life, indeed incontinence in the elderly is, as already discussed, a well recognised factor contributing to institutionalisation (Ekelund and Rundgren 1987). Studies that concentrate on the quality of life impact of urinary incontinence among women presenting for treatment not surprisingly tend to show incontinence as having a greater impact on these women than do studies of women in the community (Norton 1982;

Simeonova and Bengtsson 1990). As with other prevalence studies concerning incontinence the type of population studied needs to be borne in mind in order to place results in context.

The type of urinary incontinence experienced appears to affect the degree of perceived quality of life impairment, with individuals describing urge incontinence as having a greater impact on quality of life than stress incontinence (Wyman et al 1987; Hunskaar and Vinsnes 1991). Wyman et al hypothesised that this difference was largely due to the unpredictable nature of urge incontinence and greater associated loss of urine. Sandvik, Kveine and Hunskaar (1993) also reported a variation in the impact of different types of incontinence on certain domains of quality of life, 52% of women with urge incontinence, compared to 29% of women with stress incontinence, avoiding places without easy access to toilets. Not all authors have found this relationship. Samuelsson, Victor and Tibblin (1997) found no difference between the impact of stress and urge incontinence on those aspects of well-being studied.

There is no agreement between studies regarding the effect of the reported severity of urinary incontinence on quality of life. In a study of women attending a urodynamic clinic Norton (1982), using a specially designed questionnaire, found no relationship between symptom severity and the impact of incontinence on quality of life. A similar result was reported by Kelleher, Khullar and Cardozo (1993) in a study using the Nottingham Health Profile. Samuelsson, Victor and Tibblin (1997) did, however, reveal a relationship between the frequency of incontinent episodes and how troublesome women considered their leakage.

The relationship between age and quality of life impairment secondary to incontinence has not been widely reported and studies that have looked at the relationship between age and quality of life impact yield conflicting results. Hunskaar and Vinsnes (1991), in a study determining the impact of urinary incontinence on quality of life of women attending incontinence clinics, found that there was an age difference in quality of life impairment of women complaining of stress incontinence, with younger women revealing more impairment in the domains of quality of life than older women, particularly in the realms of recreational activity.

This may appear surprising as urinary incontinence is widely reported as being more severe in older women. However, it has been postulated that older women are prepared to accept limitations on their lifestyle as an inevitable consequence of growing old (Ory, Wyman and Yu 1986), whereas younger women might not tolerate similar restrictions so readily. However, Kelleher, Khullar and Cardozo (1993) in a similar study found that it was older women who described more quality of life impairment than younger women. Interestingly, in contrast to the previous two studies Norton (1982), in a study of women presenting to a urodynamic clinic, found no relationship between age and quality of life impairment. The lack of consensus in the literature therefore gives no clear indication as to the relationship between age and quality of life.

The effect of urinary symptoms on individual aspects of quality of life

The type of lifestyle restrictions imposed by incontinence reported in the community study by Brocklehurst (1993) were restriction of fluid intake, avoidance of places without access to public toilets, and restriction of physical activities such as lifting. There is general agreement in the literature that it is in these areas that urinary symptoms have most impact and disease specific questionnaires comprise questions designed to measure these aspects, such as avoidance of places without access to public toilets and restriction of physical exercise.

Fluid restriction has been commonly reported as a means employed to control incontinence (Brink, Wells and Diokno 1987; Herzog et al 1989; Klemm and Creason 1991), although its efficacy as a method of controlling urinary symptoms is not proven. There are few studies that examine the effectiveness of fluid restriction as a method of controlling incontinence. Griffiths et al (1993), in one of the few relevant studies looking at the effect of fluid restriction on urinary symptoms in women, reported that fluid restriction yielded only a small reduction in nocturnal incontinent episodes. Restriction of fluid intake as a means of controlling urinary symptoms is not exclusive to women. In a study of the impact of urinary symptoms on quality of life in men using the

ICSQuality of life questionnaire, Donovan et al (1997) found that fluid restriction was common in men complaining of storage symptoms.

It is recognised that easy access to toilets can help control incontinence. This is illustrated by an observation that incontinence is associated with restricted mobility (Wyman et al 1993). Incontinence can cause restriction in social activity by limiting places visited and by interfering with social relationships. Access to toilets is often reported as a factor that limits social activity, with incontinent women altering their lifestyle to avoid places without easy access to toilets (Wyman et al 1987). This can result in social isolation secondary to avoidance of meeting places such as shops, church, theatre and dances (Norton 1982).

Social relationships can be affected by incontinence partly as a result of the taboo nature of incontinence with its associated shame and the reluctance of sufferers to discuss their condition (Brink, Wells and Diokno 1987; Ashworth and Hagan 1993). A study of housebound elderly revealed that incontinent elderly women had less social interaction than continent women (Breakwell and Walker 1988). This social isolation associated with incontinence has been found in other studies of elderly women (McGrother et al 1987a; Grimby et al 1993) and may be related to the social stigma of incontinence. Lam et al (1992) reported that 19% of incontinent women abstained from some sort of social activity, such as visiting friends, sport, or shopping, or did not go to work.
The inability to exercise, for fear of leakage, has been described in studies of incontinent women (Norton 1982; Norton et al 1988), and this may make weight reduction even more difficult with consequent exacerbation of stress incontinence and implications for the outcome of any surgery.

Effects of urinary symptoms on sexual function

Urinary symptoms, and incontinence in particular, have been shown to effect women's sexual function, although few women readily volunteer this (Hilton 1988). Few of the prevalence studies of incontinence already described include data concerning the impact of incontinence on the sexual function of women. However in a large study of Danish

women 6% of incontinent women said that they abstained from sexual intercourse (Lam et al 1992).

In a detailed study of women attending a urodynamic unit complaining of incontinence Sutherst (1979) found that 46% of women maintained that their urinary problem had affected their sexual function adversely, while Norton et al (1988) found that incontinent women in a similar clinical setting blamed their abstention from sexual activity on incontinence. These findings are reinforced by a similar study by Kelleher et al (1994) of women attending a urodynamic clinic. In this study 56.5% of women felt that their urinary symptoms had interfered with their sexual life. It was interesting to note in this study that a urodynamic diagnosis of incontinence did not always agree with complaints of sexual dysfunction. Over 50% of women with normal urodynamics felt that their sexual life had been affected by their symptoms. Indeed, more women stated that their urinary symptoms had interfered with their sexual function than described incontinence. This suggests that urinary symptoms independent of incontinence adversely affect a woman's sexuality, although this has seldom been described.

Some of the studies that concern sexual function have attempted to correlate the type of incontinence with the type of sexual dysfunction. Stress incontinence has been shown to be associated with leakage of urine during intercourse, whereas both detrusor instability and stress incontinence are related to leakage during orgasm (Hilton 1988). Dyspareunia was found to be more common in women with detrusor instability than those with stress incontinence (Sutherst 1979).

In contrast to the above studies, a smaller study of 110 women showed no difference in sexual dysfunction between continent and incontinent women and uterovaginal prolapse (Weber et al 1995). Age was found to be the most important predictor of sexual function with an increase in age being related to increasing sexual dissatisfaction. Diokno, Brown and Herzog in a study of elderly people in Washtenaw County (1990) also found that sexual activity declined with age, with sexual activity depending to a great extent on the marital status of the individual. Continence status was not, however, associated with sexual difficulty.

The majority of studies that have examined the relationship between incontinence and sexual function have shown that there is a relationship between incontinence and sexual dysfunction. A Swedish study has investigated whether symptom cure resulted in an improvement in sexual satisfaction. Surgery for stress incontinence was surprisingly not shown to result in an improvement in sexual satisfaction. The frequency of intercourse was the same both before and after surgery (Berglund and Fugl-Meyer 1996; Berglund et al 1996).

Urinary symptoms therefore appear to have a significant, if not widely appreciated, impact on a woman's sexuality. The relationship is complex, however, as indeed is sexuality.

Conclusions

Urinary symptoms, and incontinence in particular, can thus be seen to affect many aspects of the life of a sufferer with economic, quality of life and sexual implications.

SECTION 2

METHODS

CHAPTER 3

BACKGROUND TO METHODOLOGY

Choice of lower urinary tract symptoms questionnaire

Introduction:

As discussed in Chapter 2, there have been many studies determining the prevalence of urinary incontinence among women using a variety of instruments (for example Thomas et al 1980; Brocklehurst 1993). However, few of the self-completed questionnaires used in studies have been validated, and most of those have confined themselves to questions regarding incontinence, although a few do include questions relating to other urinary symptoms, usually urgency and nocturia (Kok et al 1992; Jolleys et al 1993; Samuelsson, Victor and Tibblin 1997). This study assessed not only the prevalence of urinary incontinence, but also that of other urinary symptoms in women and the relationships between individual urinary symptoms, perceived impact, quality of life, and sexual function. In order to obtain meaningful results it was necessary to use a questionnaire that contained both questions relating to the occurrence of a wide variety of urinary symptoms, and questions concerning quality of life and sexual function.

In order to be able to place any reliability on the results obtained from the questionnaire, the instrument used would have to have been validated to ensure that it was capable of accurately measuring the parameters required (Spitzer 1987).

Questionnaires relating to female lower urinary tract symptoms

A wide variety of self-completion questionnaires relating to lower urinary tract symptoms in women have been used in the prevalence studies previously described.

Some of these relate purely to urinary incontinence. Some include urinary symptoms and others include questions concerning aspects of quality of life.

Published questionnaires relating to urinary symptoms

Most of the prevalence studies regarding urinary symptoms, including incontinence, use self-completed questionnaires designed specifically for an individual study (Thomas et al 1980; O'Brien et al 1991) and few of these have been published. The majority have not been subjected to psychometric testing, although a small number of validated self-completion questionnaires are now available, for example the Urogenital Distress Inventory (UDI) (Shumaker et al 1994) and the Bristol Female Lower Urinary Tract Symptoms questionnaire (BFLUTS) (Jackson et al 1996).

While the absolute prevalence of incontinence may be of academic interest it is, as already discussed, the prevalence of incontinence impacting on daily life that will determine the need for relevant health services. One method of assessing impact is to ask how much an individual is troubled by a particular symptom. The UDI and BFLUTS questionnaires both include questions concerning perceived trouble. However the BFLUTS questionnaire provides a detailed assessment of both the occurrence of symptoms and the perceived impact that they have (Jackson et al 1996).

A Danish questionnaire, a corruption of the BFLUTS questionnaire has recently been described, although it appears to have poorer content validity with higher levels of missing data than the original BFLUTS questionnaire (Bernstein et al 1996).

A few questionnaires have also been published with the aim of quantifying leakage for research purposes. Bø (1994) has published the validation of two indices designed to quantify urinary leakage secondary to stress incontinence with regard to daily provocative situations.

Published questionnaires relating to quality of life

The majority of published questionnaires relating to female urinary symptoms are designed primarily to measure quality of life and have been developed for use in clinical management and research. Instruments that measure the impact of diseases on health can be classified as either generic or disease specific. In broad terms, generic instruments have the advantage of allowing comparison of the quality of life impact between different diseases. However they are not able to address all the quality of life issues for each particular disease. Disease specific questionnaires contain questions relating to the condition being studied and have the potential for greater sensitivity to change (Shumaker et al 1994).

Generic questionnaires which measure function and well-being in general terms, are designed to measure the patient's perspective in a variety of different clinical situations. A number of these instruments including the Nottingham Health Profile (Hunt and McEwen 1980), Short Form 36 (Brazier et al 1992) and Sickness Impact Profile (Bergner et al 1976) have been used in studies concerning urinary symptoms (Kelleher, Khullar and Cardozo 1993). The Nottingham Health Profile has been used in a number of studies in women (Grimby et al 1993; Kelleher, Khullar and Cardozo 1993) and has undergone extensive validation (Hunt, McEwen and McKenna 1985). The NHP is short and easy to complete, but tends to focus on the more severe end of the ill-health spectrum. Therefore most respondents in a normal population will tend to have scores near zero (Jenkinson, Wright and Coulter 1993). The Short Form 36 (SF-36) has also undergone validation (Brazier et al 1992) and has been found to be more sensitive than the NHP to lower levels of disability (Brazier et al 1992; Jenkinson, Wright and Coulter 1993). The Sickness Impact Profile has again been subject to intensive trials of validity (Bergner et al 1981). However it is a longer instrument than the NHP or SF-36, making it somewhat unwieldy to use.

In contrast, disease specific questionnaires, as their name implies, include questions specific to a particular condition. Quality of life questionnaires relating to urinary symptoms would include, for example, questions regarding fluid intake and social

restriction in relation to the availability of toilets. Clearly these parameters would not be so relevant for sufferers with other medical conditions, for example cardiac disease. Condition specific questionnaires relating to urinary symptoms include the Incontinence Impact questionnaire (Wyman et al 1987), the Symptom Impact Index (Black, Griffiths and Pope 1996), the King's Health questionnaire (Kelleher et al 1997) and the I-QoL (Wagner et al 1996). The Incontinence Impact Questionnaire was developed by the Continence Program for Women Research Group (Wyman et al 1987) from some earlier work by Norton (1982). The Incontinence Impact questionnaire is not specific to stress incontinence, but was designed to assess the impact of all forms of incontinence on quality of life. Further work has been performed on the original Incontinence Impact questionnaire which has led to the development of a further two questionnaires, the Urogenital Distress Inventory (qv) which measures the prevalence of urinary incontinence and its perceived bother, and the Incontinence Impact Questionnaire which assesses life impact (Shumaker et al 1994). Short versions of these are now available (Uebersax et al 1995).

The Symptom Impact Index (Black, Griffiths and Pope 1996) has recently been developed in order to estimate the impact of incontinence rather than other urinary symptoms on quality of life. The King's Health Questionnaire (Kelleher et al 1997) was also designed primarily to investigate the impact of incontinence on the quality of life in women and contains few questions about other urinary symptoms. The York Incontinence Perceptions Scale (Lee et al 1995) has been developed to assess a sufferer's perception of their ability to cope with their symptoms, rather than the impact of their symptoms on daily life. The I-QoL is a recently developed questionnaire designed to measure the impact of urinary incontinence primarily for use as an outcome measure in research (Wagner et al 1996).

Validation of urinary symptom questionnaires

The validation of a questionnaire is an attempt to determine its ability to perform the task for which it has been designed. Validation can be divided into three categories: content, criterion and construct validity (Streiner and Norman 1991), although other

authors have described further subdivisions, such as trait validity, discriminant validity and convergent validity (Messick 1980).

Content validity:

Content validity determines the extent to which the questionnaire relates to all aspects of the relevant subject. A questionnaire relating to urinary symptoms should thus contain questions covering a wide variety of lower urinary tract symptomatology. This can be achieved by seeking advice from professionals in the field, for example urologists and gynaecologists, about the questions that should be included. The questions should be not only comprehensive, but also clear and easily understood. This part of the validation can be achieved by observing subjects while they complete the questionnaire, determining how easy the questionnaire was both to complete and to ensure that the subjects understand what the questionnaire is trying to ask.

Criterion validity:

This can be defined as the correlation of the scale used with some other measure that is accepted as a 'gold standard' in a particular field. For questionnaires relating to incontinence this could be a pad test (Sutherst, Brown and Shawer 1981; Versi, Cardozo and Anand 1988) or cystometry (Cardozo and Stanton 1980). Criterion validation would thus involve the correlation of positive questions regarding leakage of urine with detectable leakage in a selected population.

Construct validity:

A questionnaire is designed with various 'constructs' or hypotheses anticipating the answers that a symptomatic population should give to the questions. Construct validation therefore assesses these 'constructs' by testing the ability of the instrument to differentiate between a symptomatic and a community population.

Reliability:

A questionnaire should not only have been validated to ensure that it is easily understood and measures what it is designed to, but it should also be consistent and reproducible. The reproducibility of a questionnaire can be measured by a process termed 'test-retest reliability' where the same questionnaire is completed again by individuals after only a short interval under the assumption that the condition measured should not have changed. Internal consistency is a measurement of the inter-relationships between different questions that should be measuring the same thing, for example the impact of urinary symptoms on quality of life. Cronbach (1951) described a method of quantifying this, which is known as Cronbach's alpha.

Development of the Bristol Female Lower Urinary Tract Symptoms questionnaire

The Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire originates from the ICSmale questionnaire which was developed for the International Continence Society 'Benign Prostatic Hyperplasia' study to investigate the relationships that exist between urinary symptoms. The ICSmale questionnaire differs from existing questionnaires as it includes questions covering a wide variety of urinary symptoms. Each symptom question also includes a second part asking about the problem that an individual symptom causes see Figure 3.1. The ICSmale questionnaire has undergone rigorous validation (Donovan et al 1996), but as it was designed for use in men the symptom questions concentrate on voiding dysfunction.

Figure 3.1. Example of a question from the ICSmale questionnaire.

18 Does your urine stream end with a dribble?

never ☐
occasionally ☐
sometimes ☐
most of the time ☐
all of the time ☐

How much of a problem is this for you?

not a problem ☐
a bit of a problem ☐
quite a problem ☐
a serious problem ☐

In order to adapt the ICSmale questionnaire for use in women, the emphasis of the symptom questions was altered to include more questions concerning incontinence and fewer about voiding. The BFLUTS questionnaire retains 19 core questions in common with the ICSmale questionnaire, and consists of a total of 34 questions, including nine relating to incontinence (for example: stress, urge, incontinence with no obvious precipitating cause, nocturnal enuresis and pad usage), 12 to other urinary symptoms, four to sexual function and nine questions concerning aspects of quality of life (Jackson et al 1996). Each question has two parts. The first asks women to indicate the occurrence of the symptom during the previous month on a five point Likert scale. The second part describes the degree to which the symptom causes a problem, on a four point scale (see Figure 3.1). The BFLUTS questionnaire has been shown to be psychometrically robust, with good reliability and validity (Jackson et al 1996).

Content validity was tested by determining levels of missing data and construct validity was assessed by comparing the prevalence of urinary symptoms between a clinic and community female population. Frequency/volume charts and one hour pad tests were

taken as the 'gold standards' against which the questionnaire was tested for urinary frequency and incontinence respectively for the purposes of determining criterion validity.

During the validation process the questionnaire was completed at two weekly intervals by a number of volunteers to test for stability. Internal consistency of the urinary symptom questions was performed and Cronbach's alpha for the symptom questions was high at 0.78.

The BFLUTS questionnaire thus combines a wide variety of urinary symptom questions in addition to questions about quality of life impact and sexual function.

Frequency/volume charts (Urinary diary)

Frequency/volume charts are used extensively in urological practice to assess urinary frequency, both diurnal and nocturnal, and bladder capacity (Abrams and Klevmark 1996). Frequency/volume charts can take the form of a simple sheet, where voiding times and volumes are manually recorded or as computerised diaries (Rabin, McNett and Badlani 1993). The latter are relatively recent developments and have not yet been fully evaluated. The Bristol Urodynamic Unit has used paper diaries as an adjunct to urodynamic testing since 1972 and has found that the frequency/volume charts are well accepted and are completed with few omissions.

The inclusion of voided volumes can yield valuable information which can aid diagnosis (Saito et al 1993). The voiding of frequent small amounts, for example, may indicate detrusor instability, whereas the frequent voiding of large volumes may indicate increased fluid intake or, less commonly, diabetes insipidus.

Frequency/volume charts can be adapted to include information about urinary symptoms, such as urgency, and fluid intake (Bailey, Shepherd and Tribe 1990). Frequency/volume charts vary in length from 48 hours (Larsson and Victor 1988) to 7 days (Elser, Fantl and McClish 1995). There is debate as to whether a four day or

seven day frequency/volume chart should be used. Nielson and Lupton (1996) found that a seven day chart yielded more accurate information. However, increased information from some may be gained at the expense of the compliance of others.
48 hour frequency/volume charts have been used successfully among asymptomatic women to establish normal values for voiding frequency and volumes (Larsson and Victor 1988).

Conclusions

As discussed in Chapter 1, the aims of this study were to determine the prevalence of a wide variety of urinary symptoms and their inter-relationships and effects on quality of life and sexual function. The BFLUTS questionnaire was used in view of the extensive validation that it has undergone and the breadth of questions it contains. These factors, combined with its relative short length, made it an acceptable questionnaire for use in a community-based prevalence study concerning urinary symptoms.

Sample Size

The number of women aged over 18 years registered with the family doctor practice at Pill was known to be about 2,700 when the calculation of sample size was performed. A study of the prevalence of nocturnal polyuria among men in the same practice had resulted in a 66.3% response rate (Carter 1992). Therefore, assuming a response rate of 60% for this study, and with 10% of those being incontinent, the sample size of 2,700 would yield a margin of error of about 1.5% (Altman 1991).

The Pill practice: a representative family doctor practice?

As already outlined the number of women registered with the Pill family doctor practice was an adequate number for the study from the perspective of statistical analysis.

However, in order for the results of the study to be more generally applicable, the area would need to be a representative one.

The Pill family doctor practice consists of four doctors, three male and one female and, at the time of the study, there were 2,641 women aged nineteen years and over registered with the practice out of a total practice population of 6,562. Pill is a locality situated to the west of Bristol in North Woodspring and is part of Avon Health Authority. The North Woodspring locality has no areas which are known to be more deprived than the England and Wales average on any recognised measures (Avon Health Authority). Figures from the 1991 census show low levels of renter households and high levels of car ownership for the area (Office of Population Censuses and Surveys 1993).

The following information about the practice is based on information collected by the Avon Health Authority from individual practices for the year 1996 to 1997. The Townsend score is a deprivation index based on four census variables and acts as an indicator for levels of material deprivation in any practice (Townsend, Phillimore and Beattie 1988). The four census variables used are the percentage of economically active adults who are unemployed, the percentage of permanent households with no car, the percentage of households which are overcrowded and the percentage of permanent households which are rented. A large negative value shows a comparatively affluent area whereas a high positive value indicates an area of material deprivation. The Townsend score for the Pill practice was 0.14 showing it to be close to the Avon mean of 0.

The percentage of patients, registered with the practice, aged over 65 years was 18.7%, compared with a mean of 16.4% for all practices in Avon.

The annual consultation rate shows the number of contacts with a doctor per registered patient in a single year. The number of contacts is thought to be affected by the age and sex structure of the population, social class and family type. The Fourth National Morbidity Survey gives a figure of 2.94 contacts per patient for England and Wales

(McCormick, Fleming and Charlton 1995). The mean figure for Avon Health Authority is 2.80 and for the Pill practice it was 2.97.

Other indicators of the practice population show that percentage of nursing home residents registered with the practice was 0.8% compared with a mean of 0.45% for practices in Avon.

The various social indicators for the Pill practice do not therefore fall far from the mean for the Avon Health Authority area and the practice would therefore appear to be a fairly representative one for the Avon area and the national average.

Pilot study to assess the feasibility of the study

Aims of the pilot study

The main prevalence study was intended to be carried out among all women in a population selected only by the family doctor practice with which they were registered, using the BFLUTS questionnaire and a four day frequency/volume chart. However, it was not clear whether either the BFLUTS questionnaire, which was designed primarily for the investigation of symptomatic women, or the frequency/volume chart would be acceptable for a community study. A pilot study was therefore carried out in a different family doctor practice in the same Health Authority area to assess the response rate that could be expected to be obtained using the BFLUTS questionnaire in a community sample of women.

Method

The pilot study was carried out in a group practice regulated by the same family health services authority. Fifty women aged over 19 years were selected as representative of

the women registered with the practice. The women were chosen from the practice list to represent different types of patients, i.e. frequent attenders at the practice, non-attenders, different age groups and different housing areas in the practice.

The mailing included the BFLUTS questionnaire, a four day frequency/volume chart (see Figure 3.2) and an accompanying letter which was signed by all the doctors in the practice (see Figure 3.3) in an attempt to maximise the response rate.

Figure 3.2. The frequency/volume chart used in the pilot study.

Name ..... **Date of appointment .....**

DAY	time / volume (mls) DAY-TIME	NIGHT-TIME	Number of pads used in 24 hours
1			
2			
3			
4			

AVERAGE DAILY FLUID INTAKE (in cups) .....

Figure 3.3. A copy of the accompanying letter used in the pilot study.

Dr Richard Chandler, Dr Anthony Colman, Dr Derek Stanley, Dr David Swithinbank,
Dr Anne Carswell, Dr Kate Boyd, Dr Andrew Blythe.

The Stokes Medical Centre,
Braydon Avenue,
Little Stoke,
Bristol.
BS12 6BQ.

Dear Patient,

The partners are helping Dr Lucy Swithinbank and the doctors at the Urology Department of Southmead Hospital to conduct a confidential research survey into urinary problems amongst our practice population.

As you may be aware from current publicity, urinary problems, such as leakage, are very common among women. Although we already know that urinary leakage is common, little information is available about other symptoms, such as the number of times that people get up at night to pass urine.

We hope that this research will extend our knowledge of these troublesome symptoms and I would be grateful if you would return the enclosed questionnaire in the prepaid envelope provided. The questionnaire will be returned for analysis to Dr Swithinbank at the Urodynamic Unit. It will take about 10 minutes to complete.

A chart is included for you to record the number of times you pass your urine, and the amounts you pass. If you do not feel able to complete this chart, please still return the questionnaire.

The answers are confidential. Although you have been given a code, no names will be used. No action will be taken on any information disclosed. If you would like to see someone to discuss any urinary symptoms, please make an appointment to see your own doctor.

Filling in the questionnaire is entirely voluntary, and you may change your mind at any time without giving reason and without affecting your future treatment. Should you wish to discuss this study or obtain further information, please contact Dr Lucy Swithinbank, Urodynamic Unit, Southmead Hospital, Telephone-(0117 9595187).

Yours sincerely,

Dr Richard Chandler, Dr Anthony Colman, Dr Derek Stanley, Dr David Swithinbank,
Dr Anne Carswell, Dr Kate Boyd, and Dr Andrew Blythe.

In order to simplify the mailing and to provide a more 'professional' appearance, a business reply licence was applied for from the Royal Mail and a prepaid A5 envelope was included for the return of the questionnaire (see Figure 3.4).

Figure 3.4. A copy of the A5 envelope used in both the pilot and main studies

BUSINESS REPLY SERVICE
Licence No. SWB77

2

Dr LUCY SWITHINBANK

BRISTOL UROLOGICAL INSTITUTE
SOUTHMEAD HOSPITAL
WESTBURY-ON-TRYM
BRISTOL
BS10 5BR

A second BFLUTS questionnaire and accompanying letter was sent out to non-responders after six weeks (see Figure 3.5) and women were invited to return the questionnaire uncompleted if they did not wish to take part in the study.

Telephone interviews were conducted to further assess the acceptability of the questionnaire, frequency/volume chart and accompanying letter. Ten women were selected from the original fifty, regardless of whether they had responded. They were interviewed by the investigator and asked whether or not they had returned the questionnaire, and whether they had any comments regarding the acceptability of the letters, frequency/volume chart and questionnaire.

Figure 3.5. A copy of the reminder letter used in the pilot study.

Dr Richard Chandler, Dr Anthony Colman, Dr Derek Stanley, Dr David Swithinbank,
Dr Anne Carswell, Dr Kate Boyd, Dr Andrew Blythe.

The Stokes Medical Centre,
Braydon Avenue,
Little Stoke,
Bristol.
BS12 6BQ.

Dear Patient,

Six weeks ago we sent you a questionnaire to fill in asking about urinary symptoms. As we have not received a completed questionnaire or chart from you, I am sending you another one. I would be grateful if you could complete this and return it in the prepaid envelope provided. If you do not wish to complete the questionnaire, please return the uncompleted questionnaire in the envelope, then we will not bother you again.

I would like to reassure you again that this is completely confidential, and I would be very grateful for your help with this important project.

Yours sincerely,

Dr Richard Chandler, Dr Anthony Colman, Dr Derek Stanley, Dr David Swithinbank,
Dr Anne Carswell, Dr Kate Boyd, Dr Andrew Blythe.

Results

Postal questionnaire:

After the first mailing, 22 questionnaires were returned completed, two were returned uncompleted, and one was returned as the patient had moved away from the area. Allowing for the patient who had moved away, this gave a response rate of 44.9% after the first mailing. 11 completed frequency/volume charts were returned with the completed questionnaires giving a response rate of 22.4% for the frequency/volume charts. 27 further questionnaires were sent out with a second letter from the family doctor practice asking patients to respond by returning an uncompleted questionnaire if they did not want to participate in the study. After the second mailing 12 further completed questionnaires and four completed frequency/volume charts were returned. This increased the response rate to 69.3% for the questionnaire and to 30.6% for the frequency/volume chart. Eight questionnaires were returned uncompleted with the second mailing. This left only five women (10%) who did not respond by either returning the questionnaire completed or uncompleted.

The age range of the responders was 24-84 years with a mean of 44.4 years.
The age distribution of responders and non-responders is illustrated in Table 3.1 and Figure 3.6.

As the pilot study was intended to assess the acceptability of the BFLUTS questionnaire and possible response rate, no further analysis of the data was undertaken.

Telephone interviews:

Six of those contacted had returned the questionnaire; four had not. All ten women found the accompanying letter clear and acceptable. The six women who completed the questionnaire found that it was clearly laid out and of a manageable length. Of the four women who did not complete the questionnaire; two women felt that it was too long, one older woman, aged 67 years, found the questions too personal, particularly those

concerning sexual function, and one woman did not complete the questionnaire as she had no urinary symptoms. Only one woman admitted to having been deterred from returning the questionnaire because of the inclusion of the frequency/volume chart, although only one woman had actually returned a completed frequency/volume chart at the time of telephone contact.

Conclusions

In the light of the results of the pilot study the questionnaire, accompanying letters and pre-printed envelopes were left unchanged. Only one woman admitted to having been deterred from returning the questionnaire by the inclusion of the frequency/volume chart. However, as the response rate from the frequency/volume charts was low, they were not included with the mailing for the main study in order to increase the response rate further.

Figure 3.6. Non-responders and responders in each of the 10-year age groups for the pilot study.

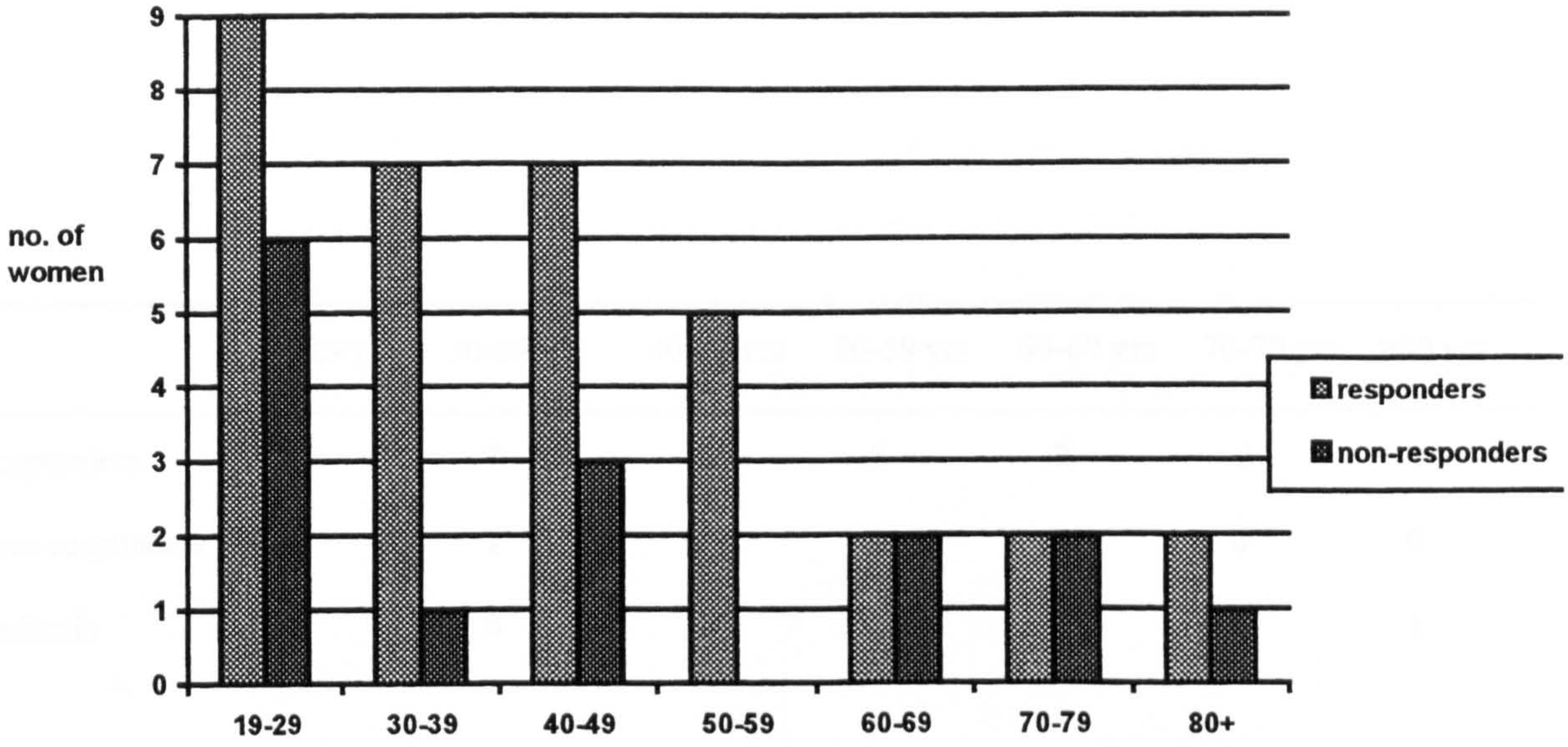


Table 3.1. The number of women who responded, failed to respond or refused to take part in the pilot study in 10-year age groups.

	19-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	>80 yrs
responders	9	7	7	5	2	2	2
non-responders	3	1	1	0	0	0	0
refusals	3	0	2	0	2	2	1

CHAPTER FOUR

METHODS OF THE STUDY

The permission of the Southmead Medical Research Ethics committee was obtained for this project (project: 49/94).

For the reasons already outlined in Chapter 3, the BFLUTS questionnaire was used in the study with an additional question asking about the type of fluids consumed. This was added to the section concerning "lifestyle". The other 34 questions remained unaltered. The modified BFLUTS questionnaire used in this study therefore contained 35 questions in total.

The BFLUTS questionnaire and accompanying letter (see Figure 4.1) was sent to all 2,641 women aged nineteen years and over, registered with the Pill family doctor practice in late 1996. The mailing included a pre-paid printed envelope as before. There was a second mailing after six weeks to non-responders including a second letter (see Figure 4.2), inviting them to return the questionnaire either completed or uncompleted.

Data were collected and entered by a firm with relevant experience in data collection. The data were double entered which, according to the firm, guaranteed an accuracy of more than 99%.

Statistical methods

The statistical packages SPSS (1995) and SAS (1996) were used for analysis of the data. The chi-square test was used to test for associations between symptom occurrence, age, troublesomeness and quality of life, with Bonferroni corrections, where appropriate, to adjust the significance level for multiple testing.

Fisher's exact test was employed in the analysis of relationships between nocturnal polyuria and other factors as the expected frequencies rendered the chi-square test

invalid. The chi-square test for trend was used to test for linear trends across age groups. Chi-square statistics were compared to detect departure from linearity (Armitage and Berry 1994).

Spearman's rank correlation was used to assess the strength of the relationship between symptom severity and perceived trouble. Categorical modelling was used to explore the combined effect of age and symptom severity on symptom troublesomeness.

Logistic regression was used to assess the combined influence of several factors on a binary outcome, eg spoilt sex life. Results are presented as odds ratios.

Analyses for relationships with age were performed for 10- and 20-year age groups, although not all analyses were performed on both age groups. Women aged between 80 and 97 years were considered as one group for the analyses in view of the relatively small number of elderly women in the study. 20-year age groups are used in many of the tables for clarity of presentation.

In the results, percentages are normally quoted to one decimal place, but have been corrected to the nearest whole number in many of the tables for clarity of presentation.

Figure 4.1. The accompanying letter used in the main study.

Drs J. du Heaume, J.S. Fligelstone, C.A, Naughton, and N.J. Kent

Tel: 01275 372105

Heywood,
Pill,
Bristol,
BS20 0DN

To All Female Patients of the Pill Practice

Dear Patient,

The partners are helping Dr Lucy Swithinbank and the doctors at the Urology Department of Southmead Hospital to conduct a confidential research survey into urinary problems amongst our practice population.

As you may be aware from current publicity, urinary problems, such as leakage, are very common among women. Although we already know that urinary leakage is common, little information is available about other urinary symptoms, such as the number of times that people get up at night to pass urine.

We hope this research will extend our knowledge of these troublesome symptoms, and I would be grateful if you could return the enclosed questionnaire in the prepaid envelope provided. The questionnaire will be returned for analysis to Dr Swithinbank at the Urology Department. It will take about ten minutes to complete.

The answers are confidential. Although you have been given a code, no names will be used. No action will be taken on any information disclosed. If you would like to see someone to discuss any urinary symptoms, please make an appointment to see your own doctor.

Filling in this questionnaire is entirely voluntary, and you may change your mind at any time without giving reason and without affecting your future treatment. Should you wish to discuss this study or obtain further information, please contact Dr Lucy Swithinbank, Urodynamic Unit, Southmead Hospital, Telephone- (0117 9595187).

Yours sincerely,

Dr J du Heaume, Dr J S Fligelstone, Dr C A Naughton, Dr N J Kent

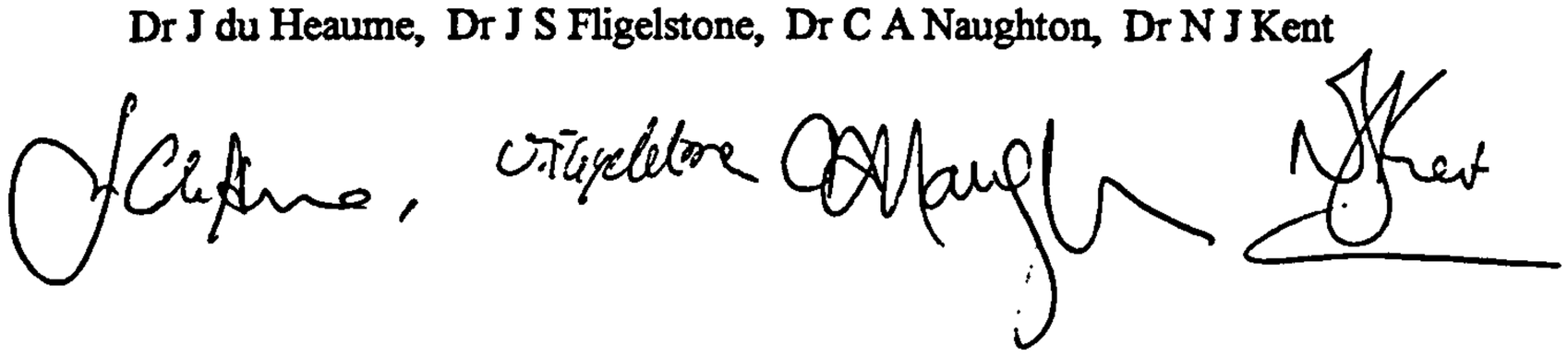


Figure 4.2. The reminder letter used in the main study.

Drs J. du Heaume, J.S. Fligelstone, C.A, Naughton, and N.J. Kent

Tel: 01275 372105

Heywood,
Pill,
Bristol,
BS20 0DN

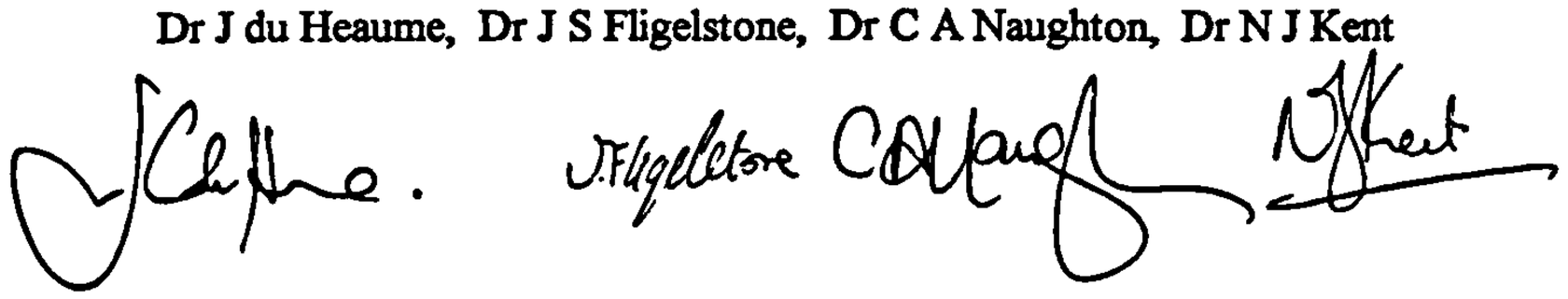
Dear Patient,

Six weeks ago we sent you a questionnaire to fill in asking about urinary symptoms. As we have not received a completed questionnaire from you, we are sending you another one. We would be grateful if you could complete this and return it in the prepaid envelope provided. If you do not wish to complete the questionnaire, please return the uncompleted questionnaire in the envelope, then we will not bother you again.

We would like to reassure you again that this is completely confidential, and we would be very grateful for your help with this important project.

Yours sincerely,

Dr J du Heaume, Dr J S Fligelstone, Dr C A Naughton, Dr N J Kent



SECTION 3

RESULTS

CHAPTER 5

RESULTS

RESPONSE TO THE QUESTIONNAIRE AND THE PREVALENCE OF URINARY SYMPTOMS

Response to the questionnaire

Of the 2641 questionnaires that were sent out, 2075 were returned completed over a three month period in the winter. One woman had removed the number from the questionnaire, therefore her questionnaire could not be included in any analysis of relationships with age. Figure 5.1 illustrates the outcome of the two mailings.

Of the non-responders to the questionnaire, 28 women or their carers gave reasons for their failure to complete the questionnaire. 12 of the women were in residential care and were reported to be incontinent. Of the other 16 women, reasons given for not completing the questionnaire included poor eyesight, being an inpatient in hospital, being perceived as incapable of completing the questionnaire, having no urinary symptoms and being in poor health.

The response rate was 63.0% after the first mailing allowing for the 41 who had moved away or died. The second mailing increased the response rate to 79.8%. During the second mailing further information was gained about women who had failed to respond with information concerning those who had moved away or were unable to complete the questionnaire.

121 questionnaires were returned uncompleted after the second mailing, leaving only 376 women, 14.4%, where the outcome was unknown. The highest response rate was among those aged 60 to 69 years with a response rate of 88.1%, and the lowest among those aged 19 to 29 years, with a response rate of 68.4%. Figure 5.2 demonstrates the proportion of responders in each ten year age group.

Among the 2641 women who were registered with the practice there were 33 who were in residential homes or a residential psychogeriatric unit. 17 completed questionnaires were returned by the women in institutional care. No questionnaires were returned from the psychogeriatric unit. The response rate for those in residential units was 51.5%, significantly lower than that for those resident in the community.

As the number of women who responded and were living in residential homes was so small, the results from their questionnaires were not analysed separately.

Figure 5.1. Flow diagram illustrating the outcome of all 2641 questionnaires sent out.

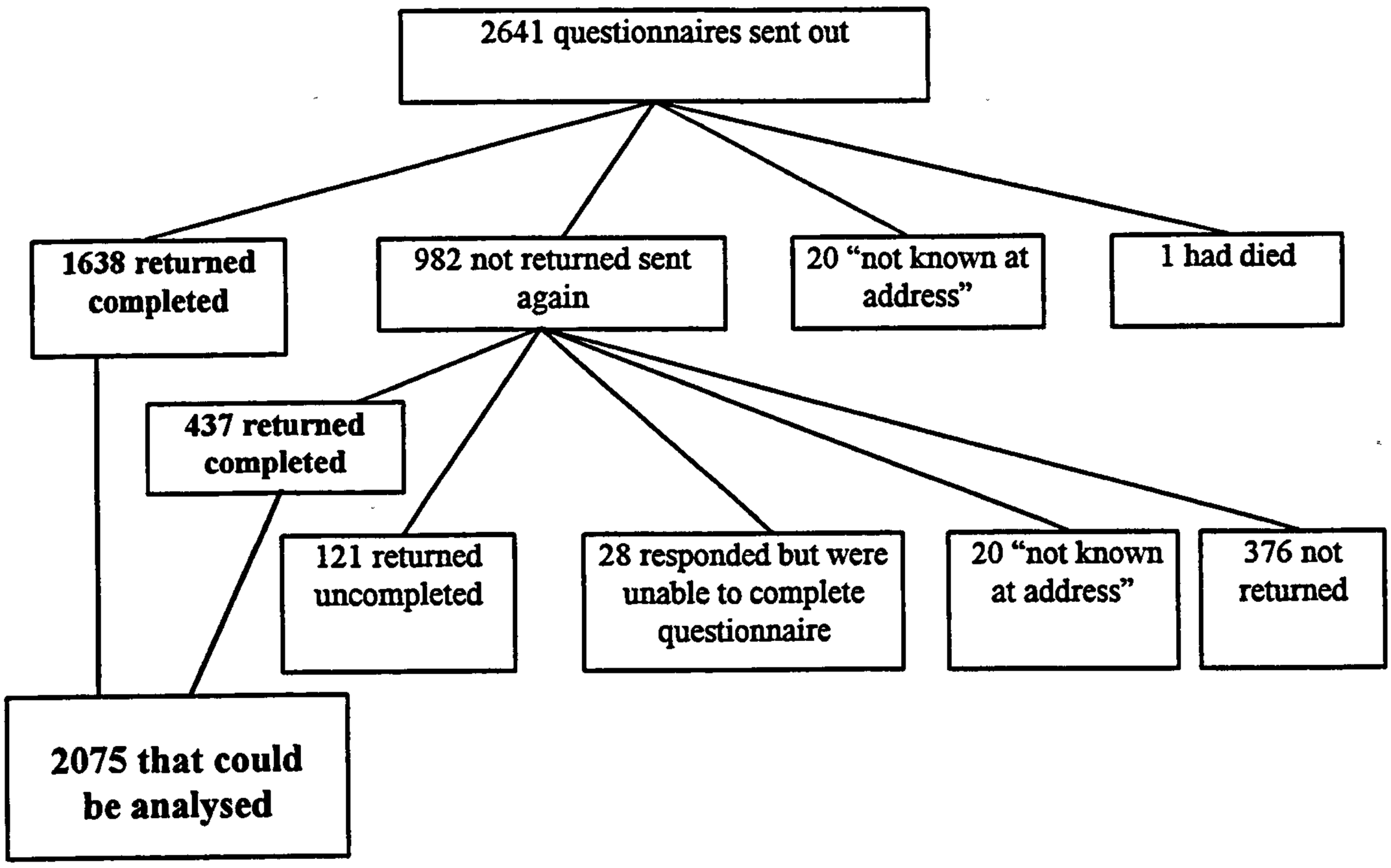
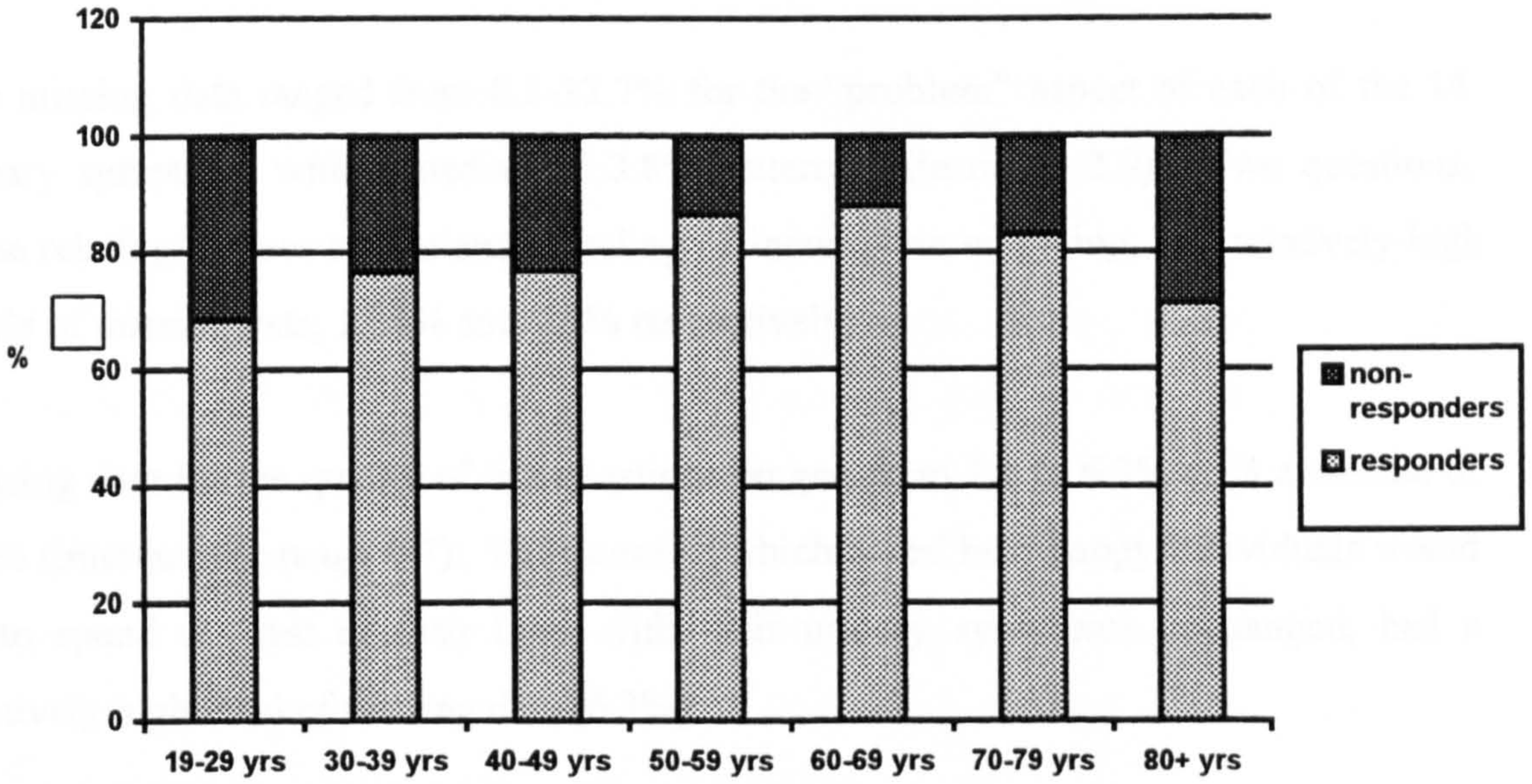


Figure 5.2. The percentage of non-responders and responders in 10-year age groups.



Missing data

Overall the amount of missing data in the study questionnaire was low. Missing data for the 14 questions that related purely to urinary symptoms, including incontinence in this study, ranged from 0.6 to 4.1% with a median value of 1.2% (interquartile range 0.5). The question relating to the strength of urinary stream had a particularly high level of missing data (4.1%).

The question relating to pad usage asked women to state whether or not they wore pads. 1874 women answered the question either positively or negatively, leaving 201 where no answer was given. The missing data for the "Yes/No" part of question 10 was therefore 9.7%.

The missing data for the second part of each question, relating to perceived trouble, was calculated for those who had admitted to experiencing that symptom at least "occasionally" during the previous month.

The missing data ranged from 0.5-13.7% for the "problem" aspect of each of the 14 urinary symptoms with a median of 3.8% (interquartile range 2.9). Two questions, those relating to poor stream and a feeling of incomplete emptying, had relatively high levels of missing data, 13.7% and 7.1% respectively.

Missing data for the quality of life questions ranged from 1.8 to 6.3% with a median of 2.0% (interquartile range 0.7). The question which asked how happy individuals would be to spend the rest of their lives with their urinary symptoms unchanged, had a relatively high level of missing data (6.3%).

At the start of the section relating to sexual function there is a question asking whether an individual was sexually active or not. If their response was "No", they were requested to refrain from answering any of the questions about sexual function. 1227 (59.1%) women stated that they were sexually active, while 31.2% stated that they were not. 200 women failed to complete this question giving a level of missing data of 9.6% for this question. Some women completed the sexual function questions even though they had not stated whether or not they were sexually active. It was therefore presumed that they were sexually active and their answers were analysed with the sexual function questions.

The levels of missing data for the symptom and bother questions were therefore low, with the exception of one or two questions. The BFLUTS questionnaire includes two questions, concerning pad usage and sexual activity, that invite a "Yes/No" response. These two questions were, however, less well completed. From this study, which uses the BFLUTS questionnaire among a large population of women, it would appear that these two questions could be better phrased.

The BFLUTS questionnaire contains two questions concerning the frequency and amount of urinary leakage. The answers to these questions were incomplete and

conflicting in this study. 1971 women (95%) had complete data for the questions concerning the type, amount and frequency of leakage. 902 women responded positively to the question asking whether they ever leaked urine, but of these 148 (16%) then answered 'no leakage' to the question concerning the amount of leakage. These inconsistencies are probably due to the positioning of these questions in the questionnaire. The question concerning frequency of leakage is positioned immediately after the question concerning urge incontinence, whereas the question concerning the amount of leakage was placed after the questions concerning stress incontinence, and incontinence for no obvious reason. The supposition that the positioning of the questions led to the erroneous impression that they referred explicitly to individual symptom questions appears to be borne out by the fact that 146 women answered 'yes' to the question concerning frequency of leakage, but denied any leakage 'for no obvious reason'. These women subsequently said that 'no leakage occurred' as a response to the general question concerning the amount of leakage.

As these general questions did not appear to have worked well they were not included in the analysis of the questionnaire apart from the correspondence analysis.

Possible effect of missing data on results of the study

The return rate varied significantly between age groups, as did the level of missing data in the questionnaires returned. The bias due to these variable completion rates was assessed when analysing the prevalence rates. In all cases the revised prevalence estimates remained within the 95% confidence intervals quoted.

Psychometric testing of the quality of life questions of the BFLUTS questionnaire

The psychometric validity of the urinary symptom questions has already been reported (Jackson et al 1996). Psychometric testing of the quality of life questions was performed during the present study. Cronbach's α was found to be 0.80 for the quality

of life questions, demonstrating that the quality of life questions had good internal consistency.

Age of responders

The age range of the 2074 responders, with stated ages, was from 19 to 97 years with a mean age of 52.2 years. The number of women who responded in each ten year age band is shown in Table 5.1. There were more than one hundred women in each 10 year age band with the largest number of women in the 50-59 year age group.

Table 5.1. The number of women who responded to the questionnaire in each 10-year age group.

Age group	Number of women (%) n=2075
19-29 years	243 (11.7)
30-39 years	289 (13.9)
40-49 years	359 (17.3)
50-59 years	479 (23.1)
60-69 years	334 (16.1)
70-79 years	251 (12.1)
> 80 years	119 (5.7)
missing	1 (<1)

Prevalence of urinary symptoms

The overall prevalence of urinary symptoms in the previous month, including the different forms of incontinence, is shown in Tables 5.2, 5.3 and 5.4. These data are calculated from the responses of all 2075 women, including the one woman whose age was unknown. The frequency of symptom occurrence is described in the same manner as in the questionnaire: "never", "occasionally" (defined as less than one third of the time), "sometimes" (between one and two thirds of the time), "most of the time" (more than two thirds of the time), and "always".

1930 women (93%) had complete data concerning urinary symptoms and age. Only 222 of these women (11.5%, 95%CI 10.1-13.1%) denied having any urinary symptoms.

Two urinary symptoms, urgency and stress incontinence, were reported by more than half of the women. However the majority of women experienced these symptoms only occasionally. Table 5.5 illustrates the prevalence of urinary symptoms in descending order.

The BFLUTS questionnaire contains four questions regarding different types of incontinence that may be experienced by women: stress incontinence, urge incontinence, nocturnal incontinence, and leakage for no obvious reason and without a desire to urinate. The question concerning incontinence for no obvious reason was designed for women who were unable to define any precipitating cause for their leakage.

The term "incontinence for no reason" is used in all the following tables to describe responses to the BFLUTS question which asked the women whether they ever leaked for no obvious reason and without the desire to void (see appendix, question 8). Incontinence for no obvious reason was associated in this study with co-existing stress and urge incontinence ($p<0.001$), indeed only three women experienced this as an isolated symptom. Although "incontinence for no reason" is included in all the following analyses concerning incontinence, it may well only represent the more severe forms of stress and urge incontinence.

Tables 5.2, 5.3, and 5.4. The prevalence of urinary symptoms and their reported occurrence in the previous month. The number of symptomatic women is shown with percentages of the responders in brackets.

Table 5.2. The prevalence of urinary symptoms in the previous month.

symptom	never (%)	occasionally (%)	sometimes (%)	most of the time (%)	always (%)
urgency n=2046	795 (39)	1021 (50)	155 (7)	63 (3)	12 (1)
stress incontinence	810 (40)	976 (48)	150 (7)	78 (4)	25 (1)
urge incontinence n=2051	1104 (54)	752 (36)	154 (7)	34 (2)	7 (<1)
incomplete emptying n=2052	1167 (57)	713 (35)	133 (6)	32 (1)	8 (<1)
intermittent stream n=2054	1523 (74)	467 (22)	50 (2)	12 (1)	2 (<1)
hesitancy n=2054	1567 (76)	434 (21)	41 (2)	9 (<1)	3 (<1)
dysuria n=2051	1572 (77)	442 (21)	32 (1)	4 (<1)	1 (<1)
bladder pain n=2048	1586 (77)	400 (19)	59 (3)	2 (<1)	1 (<1)
poor stream n=1990	1611 (81)	342 (17)	23 (1)	6 (<1)	8 (<1)
incontinence for no reason n=2043	1789 (87)	195 (9)	46 (2)	8 (1)	5 (<1)
straining n=2055	1892 (92)	138 (6)	17 (1)	6 (<1)	2 (<1)
nocturnal incontinence n=2061	1941 (94)	95 (4)	13 (1)	9 (<1)	3 (<1)

Key: occasionally <33% of the time, sometimes 33-66% of the time, most of the time >66% of the time

Table 5.3. The prevalence of daytime voiding frequencies in the previous month

no of voids per day	1-6 (%)	7-8 (%)	9-10 (%)	11-12 (%)	>13 (%)
no of women n=2058	1180 (57)	566 (28)	225 (11)	60 (3)	27 (1)

Table 5.4. The prevalence of nocturia in the previous month

no of night-time voids	0 (%)	1 (%)	2 (%)	3 (%)	≥4 (%)
no of women n=2063	755 (37)	926 (45)	258 (12)	88 (4)	36 (2)

Table 5.5. The prevalence of urinary symptoms (any degree) in descending order including 95% confidence intervals.

symptom	prevalence (%) (95%CI)
urgency	61.2 (59.0-63.3)
stress incontinence	60.3 (58.1-62.4)
urge incontinence	46.2 (44.0-48.4)
incomplete emptying	43.1 (41.0-45.3)
intermittent stream	25.9 (24.0-27.8)
hesitancy	23.7 (21.9-25.6)
dysuria	23.4 (21.5-25.2)
bladder pain	22.6 (20.8-24.4)
poor stream	19.1 (17.3-20.8)
nocturia $\geq$2	18.5 (16.8-20.2)
daytime frequency >8	15.2 (13.6-16.8)
incontinence for no reason	12.4 (11.0-13.9)
straining	7.9 (6.8-9.2)
nocturnal incontinence	5.8 (4.8-6.8)

The age prevalence of urinary symptoms

The age prevalence of urinary symptoms was calculated for the 2074 women whose age was known. Prevalence could be expressed in 10- or 20-year age groups. Table 5.6 shows the prevalence of urinary symptoms in 10-year age groups while Table 5.7 shows the prevalence in 20-year age groups.

The chi-square test was used to test for an association between symptom occurrence and age, and the chi-square test for trend was used to test for a linear trend across the age groups. Chi-square statistics were compared to detect significant departure from linear trend. The relevant p values are shown in Table 5.7.

After a Bonferroni correction for multiple testing, most symptom prevalences were found to be associated with age ($p<0.05$). The prevalences of two symptoms, straining and intermittent stream, were not associated with age. Not all the associations with age were linear. The relationship with age was not linear with diurnal frequency or nocturnal incontinence, and there were significant departures from linear trend with several other symptoms. These are shown in Table 5.7.

Poor stream and nocturia, defined as voiding at least twice a night, became increasingly common with increasing age as did urgency, urge incontinence, incontinence with no obvious cause, intermittency and stress incontinence. Nocturia, nocturnal incontinence and incontinence with no obvious cause became far more common in those aged 80 years and over. In contrast, dysuria and bladder pain decreased in prevalence with increasing age.

The age prevalences for individual urinary symptoms, including the frequency of experiencing the symptom, are shown in detail in Tables 5.8 to 5.35.

The final question in the section of the BFLUTS questionnaire that relates to urinary symptoms asks about pelvic floor function. The question asks whether an individual woman is able to stop her urinary stream voluntarily. Table 5.36 shows the women's answers expressed in 10-year age groups. There was a relationship between the ability

to stop midstream and age, with older women less able to stop their stream, $p<0.001$. There was some evidence of non-linearity in this relationship.

There was a relationship between those women who were able to stop midstream and those who experienced stress incontinence. 96% of women (n=781) who did not experience stress incontinence were able to stop midstream, compared to 81% (n=1207) who experienced stress incontinence to some degree ($p<0.0001$).

Table 5.6. Prevalence of urinary symptoms (any degree) in 10-year age groups, expressed as percentages of women in each age group, with the number of symptomatic women in each age group displayed in brackets.

	19-29 yrs % (n)	30-39 yrs % (n)	40-49 yrs % (n)	50-59 yrs % (n)	60-69 yrs % (n)	70-79 yrs % (n)	≥80 yrs % (n)
urgency	57 (138)	49 (139)	64 (227)	66 (312)	63 (208)	61 (149)	68 (78)
stress incontinence	37 (90)	53 (153)	68 (242)	71 (336)	60 (197)	61 (146)	56 (64)
urge incontinence	29 (71)	35 (99)	49 (176)	54 (254)	47 (156)	50 (122)	59 (69)
incomplete emptying	53 (126)	43 (124)	48 (172)	45 (214)	33 (109)	40 (99)	36 (41)
intermittent stream	27 (65)	19 (54)	24 (87)	28 (134)	24 (81)	28 (69)	36 (41)
hesitancy	45 (109)	23 (66)	26 (93)	19 (92)	16 (53)	18 (44)	27 (30)
dysuria	37 (89)	23 (65)	26 (92)	24 (115)	19 (64)	15 (36)	16 (18)
bladder pain	39 (95)	23 (66)	28 (98)	23 (109)	14 (46)	13 (32)	14 (16)
poor stream	10 (23)	11 (31)	18 (64)	19 (87)	21 (68)	25 (60)	41 (46)
incontinence no cause	10 (24)	7 (20)	13 (45)	15 (71)	9 (29)	15 (36)	25 (29)
straining	14 (33)	6 (17)	8 (29)	8 (40)	4 (13)	7 (16)	13 (15)
nocturnal incontinence	6 (14)	3 (9)	3 (12)	8 (40)	4 (13)	4 (11)	17 (20)
frequency >8	12 (29)	13 (37)	20 (71)	19 (90)	12 (39)	15 (38)	7 (8)
nocturia ≥2	9 (21)	9 (26)	10 (35)	16 (77)	21 (71)	37 (92)	51 (59)

The total number of women in each age group is listed below. Levels of missing data varied between age groups and questions.

Age group	Number of women
19-29 years	243
30-39 years	289
40-49 years	359
50-59 years	479
60-69 years	334
70-79 years	251
≥80 years	119

Table 5.7. Prevalence of urinary symptoms (any degree) in 20-year age groups, expressed as percentages of women in each age group, with the number of symptomatic women in each age group displayed in brackets.

	19-39 years % (n)	40-59 years % (n)	60-79 years % (n)	≥80 years % (n)	p value[a]
Urgency	53 (277)	65 (539)	62 (357)	68 (78)	<0.001°*
stress incontinence	46 (243)	69 (578)	61 (343)	56 (64)	<0.001°*
urge incontinence	32 (170)	52 (430)	48 (278)	59 (69)	<0.001°*
incomplete emptying	47 (250)	46 (386)	36 (208)	36 (41)	<0.001°
intermittent stream	23 (119)	26 (221)	26 (150)	36 (41)	0.28
Hesitancy	33 (175)	22 (185)	17 (97)	27 (30)	<0.001°*
Dysuria	29 (154)	25 (207)	17 (100)	16 (18)	<0.001°
bladder pain	31 (161)	25 (207)	13 (78)	14 (16)	<0.001°
poor stream	11 (54)	19 (151)	23 (128)	41 (46)	<0.001°*
incontinence for no reason	8 (44)	14 (116)	11 (65)	25 (29)	<0.001°*
Straining	9 (50)	8 (69)	5 (29)	13 (15)	0.07
nocturnal incontinence	4 (23)	6 (52)	4 (24)	17 (20)	<0.001
frequency >8	13 (66)	19 (161)	13 (77)	7 (8)	<0.001
nocturia ≥2	9 (47)	13 (112)	28 (163)	51 (59)	<0.001°*

[a]=χ^2 test for general association (with Bonferroni correction)

°=significant linear trend ($p<0.05$)

*=significant departure from linear trend ($p<0.05$)

The total number of women in each age group is listed below. Levels of missing data varied between age groups and questions.

Age group	Number of women
19-39 years	532
40-59 years	838
60-79 years	585
≥80 years	119

Table 5.8. Diurnal voiding frequency, expressed as the percentage of women responders in each 10-year age group.

Voiding frequency	19-29 yrs % (n=242)	30-39 yrs % (n=288)	40-49 yrs % (n=356)	50-59 yrs % (n=477)	60-69 yrs % (n=333)	70-79 yrs % (n=246)	≥80 yrs % (n=115)
1-6	66	64	52	47	61	59	67
7-8	22	23	28	34	27	25	26
9-10	8	9	14	13	9	12	6
11-12	3	3	4	3	2	2	1
≥13	<1	<1	2	3	<1	2	0

Table 5.9. Diurnal voiding frequency, expressed as the percentage of women in each 20-year age group.

Voiding frequency	19 to 39 yrs % (n=530)	40-59 yrs % (n=833)	60-79 yrs % (n=579)	≥80 yrs % (n=115)
1-6	65	49	61	67
7-8	22	32	26	26
9-10	9	13	10	6
11-12	3	4	2	1
≥13	<1	2	1	0

Table 5.10. Night-time voiding frequency, expressed as the percentage of women in each 10-year age group.

night-time voids	19-29 yrs % (n=243)	30-39 yrs % (n=288)	40-49 yrs % (n=358)	50-59 yrs % (n=476)	60-69 yrs % (n=333)	70-79 yrs % (n=248)	≥80 yrs % (n=116)
never	62	53	45	31	28	15	12
1	29	38	45	53	51	48	37
2	6	7	7	11	15	22	31
3	2	1	2	4	5	11	12
≥4	<1	1	1	1	1	4	8

Table 5.11. Night-time voiding frequency, expressed the percentage of women in each 20-year age group.

night-time voids	19 to 39 yrs % (n=531)	40-59 yrs % (n=834)	60-79 yrs % (n=581)	≥80 yrs % (n=116)
never	57	37	22	12
1	34	50	50	37
2	7	9	18	31
3	1	3	8	12
≥4	1	1	2	8

Table 5.12. The occurrence of urgency, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=285)	40-49 yrs % (n=357)	50-59 yrs % (n=473)	60-69 yrs % (n=330)	70-79 yrs % (n=245)	≥80 yrs % (n=114)
never	43	51	36	34	37	39	31
occasionally	48	43	53	52	53	49	46
sometimes	6	5	6	10	5	9	14
most of the time	2	1	4	3	4	2	6
all of the time	<1	0	1	<1	1	<1	3

Table 5.13. The occurrence of urgency, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=526)	40-59 yrs % (n=830)	60-79 yrs % (n=575)	≥80 yrs % (n=114)
never	47	35	38	31
occasionally	45	52	51	46
sometimes	6	8	7	14
most of the time	1	4	3	6
all of the time	<1	<1	1	3

Table 5.14. The occurrence of urge incontinence, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=286)	40-49 yrs % (n=356)	50-59 yrs % (n=474)	60-69 yrs % (n=331)	70-79 yrs % (n=246)	≥80 yrs % (n=116)
never	70	65	51	46	53	50	40
occasionally	24	29	39	42	40	40	37
sometimes	4	5	8	10	6	7	16
most of the time	2	1	1	1	1	2	6
all of the time	0	0	<1	<1	0	1	1

Table 5.15. The occurrence of urge incontinence, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=527)	40-59 yrs % (n=830)	60-79 yrs % (n=577)	≥80 yrs % (n=116)
never	68	48	52	40
occasionally	27	41	39	37
sometimes	4	9	6	16
most of the time	1	1	2	6
all of the time	0	1	<1	1

Table 5.16. The occurrence of bladder pain, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=285)	40-49 yrs % (n=356)	50-59 yrs % (n=473)	60-69 yrs % (n=331)	70-79 yrs % (n=247)	≥80 yrs % (n=114)
never	60	77	73	77	86	87	86
occasionally	35	22	23	19	12	11	12
sometimes	4	1	4	3	2	2	1
most of the time	<1	0	0	0	0	0	<1
all of the time	0	0	0	<1	0	0	0

Table 5.17. The occurrence of bladder pain, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=526)	40-59 yrs % (n=829)	60-79 yrs % (n=578)	≥80 yrs % (n=114)
never	69	75	86	86
occasionally	28	20	12	12
sometimes	2	4	2	1
most of the time	<1	0	0	<1
all of the time	0	<1	0	0

Table 5.18. The occurrence of stress incontinence, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=286)	40-49 yrs % (n=357)	50-59 yrs % (n=475)	60-69 yrs % (n=326)	70-79 yrs % (n=239)	≥80 yrs % (n=114)
never	63	46	32	29	40	39	44
occasionally	29	45	52	54	51	50	42
sometimes	6	5	9	9	6	7	7
most of the time	1	2	6	6	2	3	6
all of the time	1	2	1	2	1	1	1

Table 5.19. The occurrence of stress incontinence, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=527)	40-59 yrs % (n=832)	60-79 yrs % (n=565)	≥80 yrs % (n=114)
never	54	31	39	44
occasionally	38	53	51	42
sometimes	6	9	6	7
most of the time	1	6	3	6
all of the time	1	1	<1	1

Table 5.20. The occurrence of incontinence for no reason, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=240)	30-39 yrs % (n=286)	40-49 yrs % (n=357)	50-59 yrs % (n=474)	60-69 yrs % (n=327)	70-79 yrs % (n=244)	≥80 yrs % (n=114)
never	90	93	87	85	91	85	75
occasionally	9	5	9	11	7	11	17
sometimes	1	1	3	3	1	3	4
most of the time	0	<1	1	0	<1	1	2
all of the time	0	<1	0	<1	0	0	2

Table 5.21. The occurrence of incontinence for no reason, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=526)	40-59 yrs % (n=831)	60-79 yrs % (n=571)	≥80 yrs % (n=114)
never	91	86	89	75
occasionally	7	10	8	17
sometimes	1	3	2	4
most of the time	<1	<1	1	2
all of the time	<1	<1	0	2

Table 5.22. The occurrence of hesitancy, expressed as the percentage of women in each 10-year age group.

Symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=287)	40-49 yrs % (n=357)	50-59 yrs % (n=477)	60-69 yrs % (n=331)	70-79 yrs % (n=247)	≥80 yrs % (n=113)
never	55	77	74	81	84	82	73
occasionally	38	20	24	17	15	15	24
sometimes	5	2	1	1	1	2	3
most of the time	1	1	<1	<1	0	<1	0
all of the time	<1	0	0	<1	0	0	0

Table 5.23. The occurrence of hesitancy, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=528)	40-59 yrs % (n=834)	60-79 yrs % (n=578)	≥80 yrs % (n=113)
never	66	78	83	73
occasionally	28	20	15	24
sometimes	4	1	1	3
most of the time	1	<1	<1	0
all of the time	<1	<1	0	0

Table 5.24. The occurrence of straining, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=287)	40-49 yrs % (n=358)	50-59 yrs % (n=477)	60-69 yrs % (n=331)	70-79 yrs % (n=246)	≥80 yrs % (n=114)
never	86	94	92	91	96	93	87
occasionally	11	5	7	7	4	6	10
sometimes	3	1	<1	1	0	<1	2
most of the time	0	0	<1	<1	0	<1	0
all of the time	0	0	0	<1	0	0	1

Table 5.25. The occurrence of straining, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=528)	40-59 yrs % (n=834)	60-79 yrs % (n=578)	≥80 yrs % (n=114)
never	91	91	95	87
occasionally	8	7	4	10
sometimes	1	1	<1	2
most of the time	0	<1	<1	0
all of the time	0	<1	0	1

Table 5.26. The occurrence of intermittent stream, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=287)	40-49 yrs % (n=357)	50-59 yrs % (n=478)	60-69 yrs % (n=334)	70-79 yrs % (n=243)	≥80 yrs % (n=113)
never	73	81	75	72	75	71	64
occasionally	22	16	22	24	22	25	33
sometimes	5	2	2	2	2	3	2
most of the time	0	1	<1	1	<1	1	1
all of the time	0	0	0	<1	0	0	0

Table 5.27. The occurrence of intermittent stream, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=528)	40-59 yrs % (n=835)	60-79 yrs % (n=577)	≥80 yrs % (n=113)
never	77	73	74	64
occasionally	19	23	23	33
sometimes	3	2	2	2
most of the time	<1	1	1	1
all of the time	0	<1	0	0

Table 5.28. The occurrence of nocturnal incontinence, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=287)	40-49 yrs % (n=357)	50-59 yrs % (n=479)	60-69 yrs % (n=333)	70-79 yrs % (n=248)	≥80 yrs % (n=115)
never	94	97	97	91	96	95	83
occasionally	5	2	3	7	3	3	8
sometimes	<1	0	0	1	<1	1	2
most of the time	0	<1	0	0	<1	<1	5
all of the time	0	0	0	<1	0	0	2

Table 5.29. The occurrence of nocturnal incontinence, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=528)	40-59 yrs % (n=836)	60-79 yrs % (n=581)	≥80 yrs % (n=115)
never	95	94	96	83
occasionally	4	5	3	8
sometimes	<1	<1	<1	2
most of the time	<1	0	<1	5
all of the time	0	<1	0	2

Table 5.30. The occurrence of reduced urinary stream, expressed as the percentage of women in each 10-year age group.

strength of stream	19-29 yrs % (n=229)	30-39 yrs % (n=2761	40-49 yrs % (n=357)	50-59 yrs % (n=464)	60-69 yrs % (n=321)	70-79 yrs % (n=237)	≥80 yrs % (n=111)
not reduced	90	89	82	81	79	75	59
reduced a little	9	9	16	17	19	23	37
quite reduced	0	1	1	1	1	1	1
reduced a great deal	<1	0	<1	<1	0	<1	1
no stream	0	1	<1	0	<1	0	2

Table 5.31. The occurrence of reduced urinary stream, expressed as the percentage of women in each 20-year age group.

strength of stream	19-39 yrs % (n=505)	40-59 yrs % (n=815)	60-79 yrs % (n=558)	≥80 yrs % (n=111)
never	89	81	77	59
occasionally	9	17	21	37
sometimes	1	1	1	1
most of the time	<1	<1	<1	1
all of the time	<1	<1	<1	2

Table 5.32. The occurrence of dysuria, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=241)	30-39 yrs % (n=287)	40-49 yrs % (n=355)	50-59 yrs % (n=476)	60-69 yrs % (n=332)	70-79 yrs % (n=246)	≥80 yrs % (n=113)
never	63	77	74	75	81	85	84
occasionally	32	22	25	22	18	13	13
sometimes	5	<1	1	2	1	1	0
most of the time	0	0	0	<1	0	<1	2
all of the time	0	0	0	0	0	0	1

Table 5.33. The occurrence of dysuria, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=528)	40-59 yrs % (n=831)	60-79 yrs % (n=578)	≥80 yrs % (n=113)
never	71	75	82	84
occasionally	26	23	16	13
sometimes	3	1	1	0
most of the time	0	<1	<1	2
all of the time	0	0	0	1

Table 5.34. The occurrence of a feeling of incomplete emptying, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=240)	30-39 yrs % (n=287)	40-49 yrs % (n=357)	50-59 yrs % (n=475)	60-69 yrs % (n=332)	70-79 yrs % (n=247)	≥80 yrs % (n=114)
never	47	57	52	55	67	60	64
occasionally	38	36	39	37	27	34	26
sometimes	12	4	6	6	6	5	8
most of the time	2	3	2	1	0	1	2
all of the time	<1	0	1	1	0	0	0

Table 5.35. The occurrence of a feeling of incomplete emptying, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=527)	40-59 yrs % (n=832)	60-79 yrs % (n=579)	≥80 yrs % (n=114)
never	52	54	64	64
occasionally	37	37	30	26
sometimes	8	6	5	8
most of the time	2	2	1	2
all of the time	<1	1	0	0

Table 5.36. The occurrence of an ability to stop midstream while urinating, expressed as the percentage of women in each 10-year age group.

symptom occurrence	19-29 yrs % (n=239)	30-39 yrs % (n=286)	40-49 yrs % (n=356)	50-59 yrs % (n=469)	60-69 yrs % (n=319)	70-79 yrs % (n=238)	≥80 yrs % (n=110)
unable to stop stream	4	2	5	7	7	12	20
stops stream with difficulty	12	19	25	24	16	20	25
can easily stop stream	84	79	70	69	77	68	55

Table 5.37. The occurrence of an ability to stop midstream while urinating, expressed as the percentage of women in each 20-year age group.

symptom occurrence	19-39 yrs % (n=525)	40-59 yrs % (n=825)	60-79 yrs % (n=557)	≥80 yrs % (n=110)
unable to stop midstream	3	6	10	20
stops stream with difficulty	16	24	18	24
can easily stop stream	81	70	72	56

The prevalence of incontinence

Questions concerning the prevalence of four different types of incontinence were included in the questionnaire. These different types of incontinence were: stress incontinence, urge incontinence, incontinence with no obvious cause and nocturnal incontinence. Their prevalence has already been described.

The overall prevalence of incontinence in this study can be portrayed in a number of ways. As already mentioned, the age of one responder was unknown and a further 27 women had omitted to complete any of the questions concerning incontinence. This left 2047 women where age and continence status was known. Women were considered to be incontinent if they had answered any of the four questions regarding the different types of incontinence positively. The number of women who reported any incontinence in the past month was 1414, representing 69.1% (95%CI 67.1-71.1%) (n=2047) of those where age and incontinence status was known. Pure stress, and mixed stress and urge incontinence were the most commonly reported forms of incontinence, accounting for 67.1% of those whose incontinence could be categorised. It was interesting to note that no woman described nocturnal incontinence as an isolated form of incontinence. This is illustrated in Table 5.38.

Figure 5.3 shows the age prevalence of the three most common forms of incontinence: mixed stress and urge incontinence, stress incontinence and urge incontinence.

Defining incontinence purely by occurrence yields a high prevalence figure. However, only 364 women reported using pads or changing their underwear to cope with incontinence (28.5% (95%CI 26.1-31.0%) of the 1277 women reporting incontinence with complete data for pad usage and incontinence status). The ICS definition of incontinence (Bates et al 1976) can be applied to our data by determining the number of women whose incontinence interfered with their social life or caused a hygienic problem. Incontinence was regarded as having social impact if the women indicated

that their incontinence prevented them from visiting places without easy access to toilets (question 29), or going out (question 31). A positive answer to either question 29 or 31 in the modified BFLUTS questionnaire was taken as indicating that incontinence had a social impact. Incontinence was regarded as a hygienic problem if women needed to change their underwear or wear pads because of their incontinence. The number of women who fulfilled the ICS definition of incontinence in this manner was 578 of the 1936 women with sufficient data for analysis, giving an overall prevalence of 29.8% (95%CI 27.8-31.9%), (Figure 5.4).

The prevalence of incontinence defined purely by occurrence varied with age; with 54.5% (19-39 years), 75.7% (40-59 years), 71.2% (60-79 years) and 76.3% (80+ years) reporting some incontinence in the previous month ($p<0.001$ for linear trend). There was a similar relationship between age and women finding their incontinence a social or hygienic problem, with prevalences of 16.1% (19-39 years), 33.9% (40-59 years), 33.9% (60-79 years) and 46.9% (80+ years) ($p<0.001$ for linear trend). This is shown in Figure 5.5.

All women were asked to what degree their incontinence caused them problems. 745 women, 61.1% (95%CI 58.3-63.8%) of the 1220 incontinent women with complete data for perceived trouble and incontinence status, found their incontinence "at least a bit of a problem". This represents 40.2% (95%CI 37.9-42.5%) of the 1853 women with complete data for incontinence and perceived impact. There were significant differences between the numbers of women who perceived their incontinence as troublesome in the different age groups ($p<0.001$), but not a clear linear relationship ($p=0.06$). The proportion of women with "troublesome" incontinence in different age groups were: 31.1% (19-39 years), 48.4% (40-59 years), 35.5% (60-79 years) and 45.9% (80+ years).

Table 5.38. The total number of incontinent women subdivided by type of incontinence.

total number of incontinent women	**1414**	**%**
mixed stress and urge incontinence	508	36.6
pure stress incontinence	442	31.9
stress and urge incontinence and incontinence for no reason	149	10.7
urge incontinence	149	10.7
stress and urge incontinence and incontinence for no reason and nocturnal incontinence	68	4.9
stress and urge incontinence and nocturnal incontinence	32	2.3
stress incontinence and incontinence for no reason	11	<1
urge incontinence and incontinence no reason	11	<1
urge incontinence and nocturnal incontinence	5	<1
stress incontinence and nocturnal incontinence	3	<1
stress incontinence and incontinence for no reason and nocturnal incontinence	3	<1
urge incontinence and incontinence for no reason and nocturnal incontinence	3	<1
incontinence for no reason	3	<1
nocturnal incontinence	0	
nocturnal incontinence and incontinence for no reason	0	
unable to define type of incontinence owing to incomplete data	27	

Figure 5.3. The age prevalence of stress incontinence, urge incontinence and mixed stress and urge incontinence, expressed as the percentage of all women who responded to the questions concerning incontinence described in 10-year age groups (n=2035).

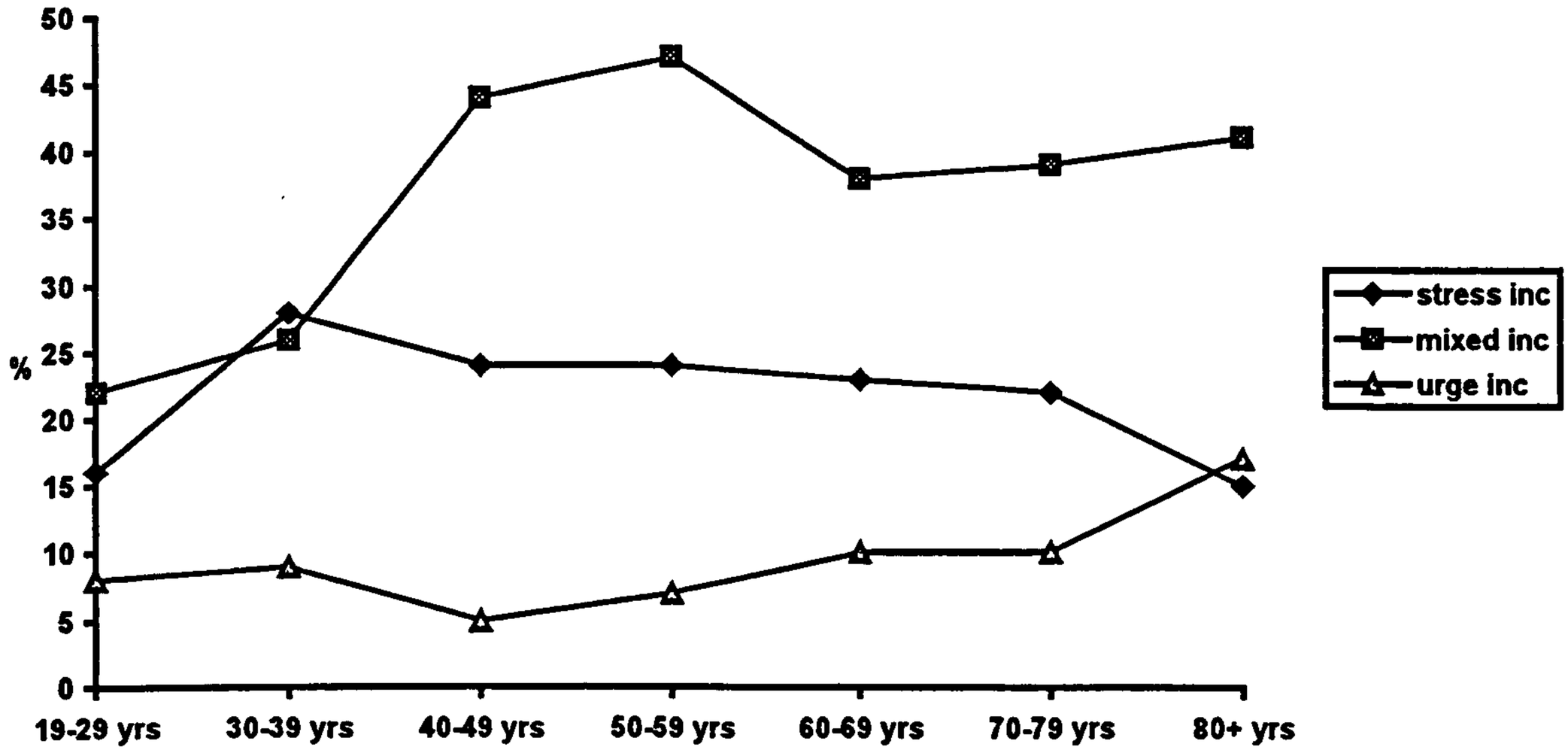


Figure 5.4. Flow diagram showing the method employed for calculating incontinence as a social or hygienic problem.

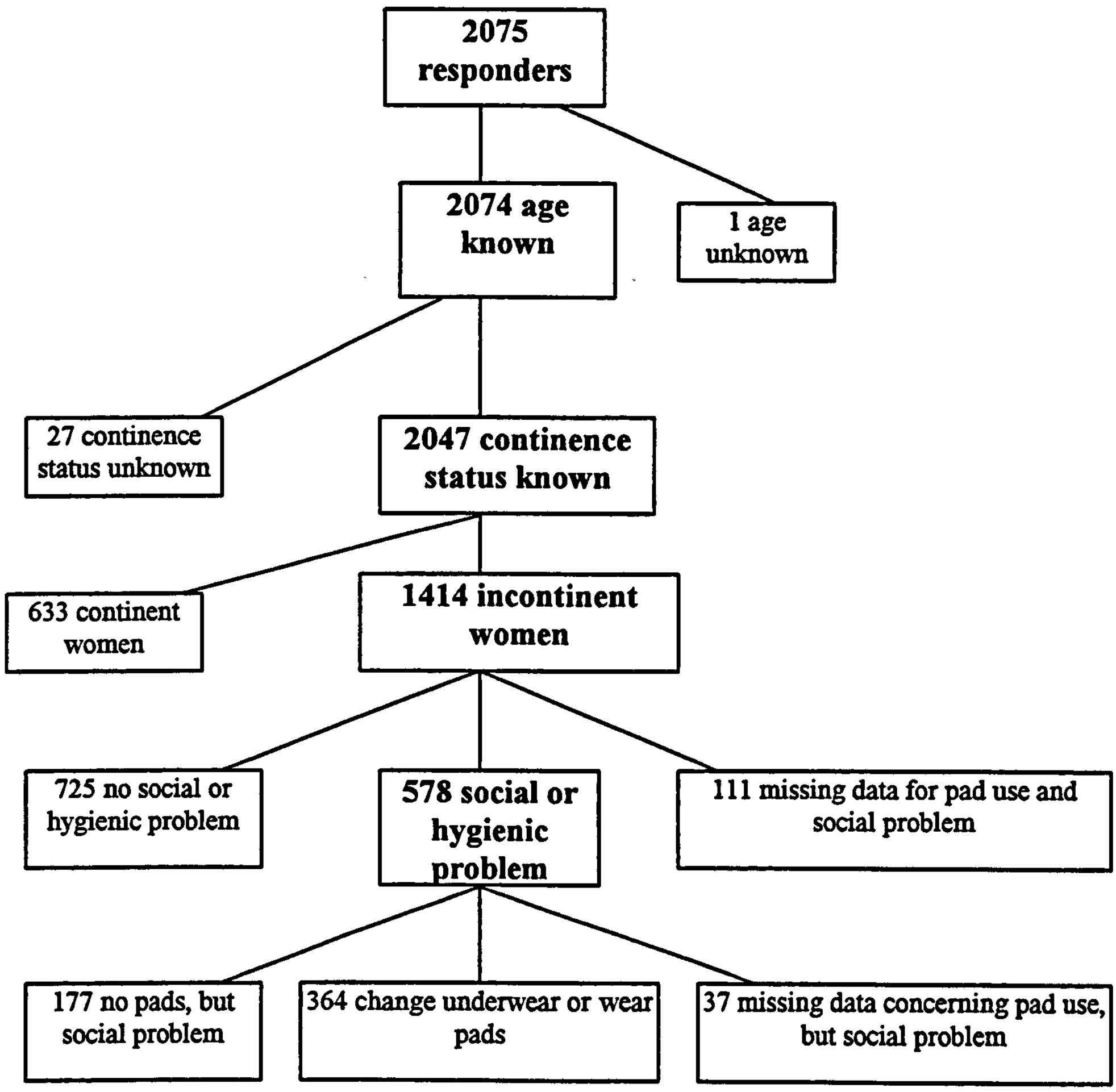
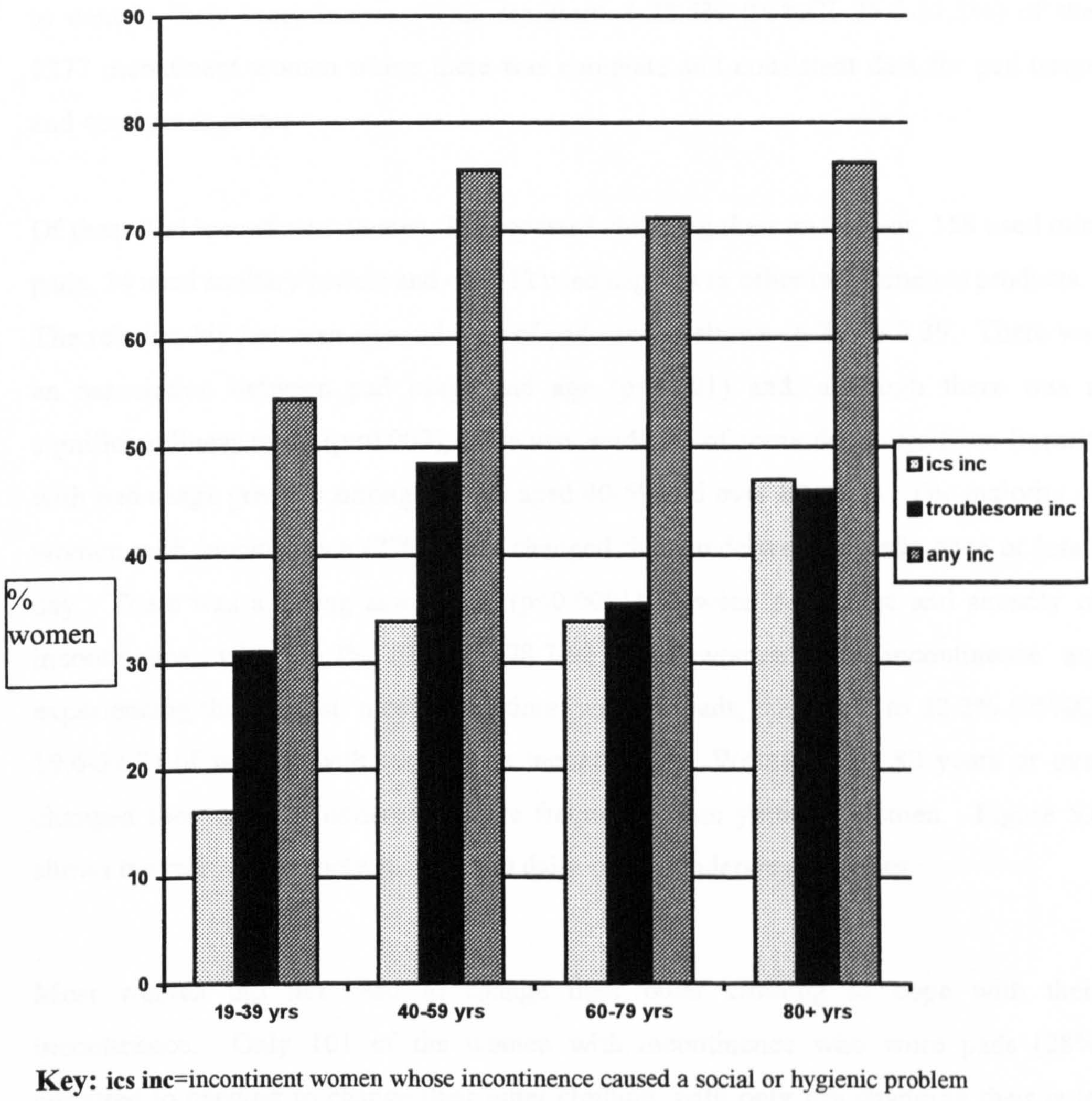


Figure 5.5. The prevalence of the different definitions of incontinence, expressed as percentages of women in 20-year age groups.



Key: ics inc=incontinent women whose incontinence caused a social or hygienic problem

troublesome inc=incontinent women whose incontinence caused them at least "a bit of a problem"

any inc=women who admitted to incontinence regardless of whether it had any impact on their lives

Pad and catheter usage among incontinent women

Pad usage among women with incontinence

364 incontinent women reported that they either changed their underwear or wore pads to contain their incontinence. This represented 28.5% (95%CI 26.0-31.1%) of the 1277 incontinent women where there was complete and consistent data for pad usage and continence status.

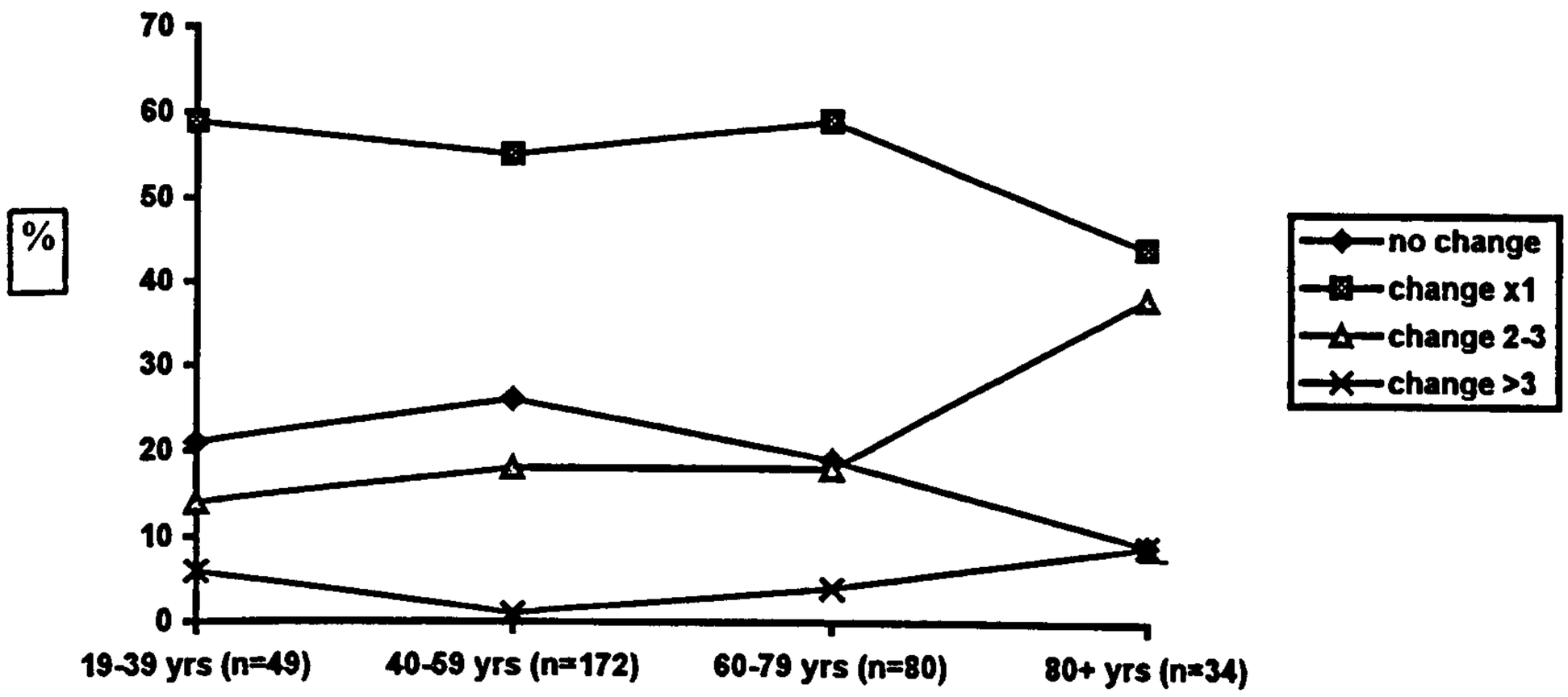
Of these 364 incontinent women, 180 reported changing their underwear, 158 used mini pads, 14 used sanitary towels and only 12 used nappies or other incontinence products. The relationship between age and type of pad used is shown in Table 5.39. There was an association between pad usage and age ($p<0.001$) and, although there was a significant linear trend ($p=0.002$), there was evidence of some departure from linearity with pad usage greatest among women aged 40-59 and over 80 years. The majority of women with incontinence (77%) only changed their underwear or pads once or less a day. There was a strong association ($p<0.0001$) between pad usage and severity of incontinence, with 86.2% (95%CI 78.7-91.8) of women with incontinence and experiencing this at least 'most of the time' wearing pads, compared to 22.2% (95%CI 19.6-24.7) of women with less severe incontinence. Women aged 80 years or over changed their pads or underwear more frequently than younger women. Figure 5.6 shows the relationship between age and daily pad or underwear changes.

Most women did not need to change their outer clothing to cope with their incontinence. Only 101 of the women with incontinence who wore pads (28%) admitted to needing to change their outer clothing, with only 6% changing their outer clothes for more than one third of the time.

Table 5.39. The type of pads used by incontinent women (n=364).

	19-39 yrs (%)	40-59 yrs (%)	60-79 yrs (%)	≥80 yrs (%)
change underwear	28 (53)	101 (53)	39 (45)	12 (34)
mini pads	23 (43)	82 (43)	41 (47)	12 (34)
sanitary towels	2 (4)	3 (2)	6 (7)	3 (9)
nappies	0 (0)	3 (2)	1 (1)	8 (23)

Figure 5.6. The relationship between age and the number of daily pad or underwear changes.



Catheter usage among women with incontinence

Question 17 in the BFLUTS questionnaire asked whether women had ever "blocked up" to the extent that they had required a catheter to drain the bladder. 54 women with incontinence, 3.8% (95%CI 2.9-5.0%) of the 1398 women with complete data for continence status and catheter usage, had required catheterisation compared with 23 continent women, 3.6% (95%CI 2.3-5.4%) of the 632 continent women with complete data. There was therefore no significant difference in catheter usage between incontinent and continent women (p=0.81).

The age range of incontinent women who had used catheters is shown in Table 5.40 with age shown in 20-year age groups. There was no statistically significant relationship between age and catheter usage among incontinent women (p=0.69).

Table 5.40. Catheter usage among incontinent women, expressed as the percentage of women in each 20-year age group.

	19-39 yrs (n=284) %	40-59 yrs (n=628) %	60-79 yrs (n=403) %	≥80 yrs (n=83) %
catheters never used	97	96	96	98
catheters used at least once	3	4	4	2

CHAPTER 6

THE PREVALENCE OF TROUBLESOME URINARY SYMPTOMS

As already outlined in Chapter 3 each question in the BFLUTS questionnaire contains a second part asking about whether each individual symptom caused a problem. This was completed as part of a four point scale from "not a problem" to "a serious problem" (see Figure 6.1).

Figure 6.1. An example of a question from the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire.

4. Does urine leak before you can get to the toilet?

never ☐
occasionally ☐
sometimes ☐
most of the time ☐
all of the time ☐

How much of a problem is this for you?

not a problem ☐
a bit of a problem ☐
quite a problem ☐
a serious problem ☐

The percentage of symptomatic women who found each symptom troublesome was calculated. Women who admitted to experiencing a symptom at least "occasionally" were included in the analysis. Table 6.1 shows the proportion of women experiencing an individual symptom, as well as the number of symptomatic women who found each individual symptom troublesome. Correlation of symptom severity and troublesomeness was investigated using Spearman's rank correlation. Table 6.1

illustrates that the most prevalent symptoms are not necessarily the most troublesome ones.

The symptoms which were reported to cause the greatest problems were those of incontinence, particularly incontinence for no obvious reason and nocturnal incontinence, which were perceived as a problem by more than 70% of those who experienced them (see Table 6.1). Nocturia, urge and stress incontinence and frequency were also reported to cause at least 'a bit of a problem' in more than half of those who reported the symptom (see Table 6.1). The discrepancy between the most prevalent and most troublesome symptoms is shown in Table 6.2 which compares the most prevalent symptoms with those that were most troublesome to symptomatic women. As can be seen storage symptoms were more troublesome to sufferers than voiding symptoms.

Table 6.1. The prevalence of urinary symptoms among women in descending order of overall amount of perceived impact caused by each symptom and rank correlation of symptom severity.

		no of symptomatic women experiencing symptoms as a problem				
symptom	no. of women experiencing symptom (%)	'no problem'	'a bit of a problem'	'quite a problem'	'a serious problem'	ρ*
urgency	1251 (61)	767 (63)	355(29)	81 (7)	10 (1)	0.59
stress incontinence	1229 (60)	594 (49)	500 (42)	85 (7)	18 (2)	0.57
urge incontinence	947 (46)	407 (44)	426 (46)	69 (8)	14 (2)	0.49
incomplete emptying	886 (43)	526 (64)	265 (32)	27 (3)	5 (1)	0.53
intermittent stream	531 (26)	442 (89)	51 (10)	3 (<1)	1 (<1)	0.40
hesitancy	487 (24)	393 (84)	69 (15)	2 (<1)	1 (<1)	0.43
dysuria	479 (23)	249 (53)	201 (43)	14 (3)	2 (<1)	0.29
bladder pain	462 (23)	243 (53)	195 (43)	12 (3)	2 (<1)	0.38
poor stream	379 (19)	278 (85)	45 (14)	4 (1)	0	0.35
incontinence for no reason	254 (12)	66 (27)	144 (60)	24 (10)	6 (3)	0.48
straining	163 (8)	111 (71)	42 (27)	2 (1)	1 (1)	0.50
nocturnal incontinence	120 (6)	35 (31)	63 (56)	12 (11)	3 (2)	0.48
frequency >8	312 (15)	151 (50)	108 (35)	42 (14)	2 (<1)	0.42
nocturia ≥2	382 (19)	142 (37)	183 (48)	49 (13)	6 (2)	0.51

*ρ = rank correlation adjusted for age

Table 6.2. The most common symptoms and the symptoms that were perceived as troublesome by the greatest percentage of symptomatic women.

(Storage symptoms are shown in italics.)

Symptom prevalence in descending order (%)	Percentage of symptomatic women who found symptom troublesome in descending order (%)
urgency (61)	*incontinence for no reason (73)*
stress incontinence (60)	*nocturnal incontinence (69)*
urge incontinence (46)	*nocturia ≥2 (63)*
incomplete emptying (43)	*urge incontinence (56)*
intermittent stream (26)	*stress incontinence (50)*
hesitancy (24)	*daytime frequency (50)*
dysuria (23)	dysuria (47)
bladder pain (23)	*bladder pain (46)*
poor stream (19)	*urgency (37)*
nocturia ≥2 (19)	incomplete emptying (36)
daytime frequency (15)	straining (29)
incontinence for no reason (12)	hesitancy (15)
straining (8)	poor stream (15)
nocturnal incontinence (6)	intermittent stream (11)

The association between symptom severity, age and troublesomeness

The troublesomeness of the two most common forms of incontinence, stress and urge incontinence, was compared for different levels of occurrence in symptomatic women. Table 6.3 and Figure 6.2 show that, while stress incontinence is the more common of the two symptoms, urge incontinence is the more troublesome symptom.

Moderate correlations were observed between symptom severity and associated perceived trouble for all urinary symptoms (see Table 6.1 where partial correlation coefficients, adjusted for age, are shown).

Categorical modelling was also used to explore the combined effect of age and symptom severity on symptom troublesomeness.

For several urinary symptoms, both age and symptom severity were associated with troublesomeness. Voiding symptoms of hesitancy, straining and intermittency and urge incontinence were all more problematic with increasing symptom severity ($p<0.00001$) and age.

Urgency and frequency were also more troublesome with increasing symptom severity ($p<0.00001$) and age, apart from women who had the most severe frequency, where the 60-79 year age group were less troubled by their symptoms than women in other age groups.

Although nocturia was more troublesome if night-time voiding was more frequent ($p<0.00001$), women of all ages were equally troubled by their symptoms if they voided four or more times at night. Of the women with lower night-time voiding frequencies, those in the 60-79 year age group were the least troubled by their symptoms.

In contrast, stress incontinence was more troublesome to younger women ($p<0.00001$). More severe stress incontinence was more troublesome than less severe incontinence ($p<0.00001$).

Six symptoms (bladder pain, dysuria, poor stream, intermittent stream, incontinence for no reason and nocturnal incontinence) were more troublesome if experienced frequently, but there was no relationship between age and symptom impact.

Tables 6.4 to 6.15 show the relationships that exist between symptom occurrence and troublesomeness for all urinary symptoms contained in the BFLUTS questionnaire, apart from urinary frequency and nocturia, which will be discussed later in this chapter.

The difference in perceived impact experienced by symptomatic women of different ages is shown in Tables 6.16 to 6.29. Women were regarded as symptomatic if they experienced an individual symptom at least "occasionally". Age is expressed in 20-year age groups in these tables.

Table 6.3. Comparing the proportion of women with urge and stress incontinence who found their symptoms troublesome with different levels of occurrence expressed as percentages of responders.

	urge incontinence <2/3 of the time % (n=877)	urge incontinence >2/3 of the time % (n=39)	stress incontinence <2/3 of the time % (n=1095)	stress incontinence >2/3 of the time % (n=102)
"not a problem"	46	2	54	4
"a bit of a problem"	48	8	43	22
"quite a problem"	5	59	2	57
" a serious problem"	<1	31	<1	17

Figure 6.2. Illustrates to what extent women with a different severity of stress or urge incontinence found their symptoms troublesome.

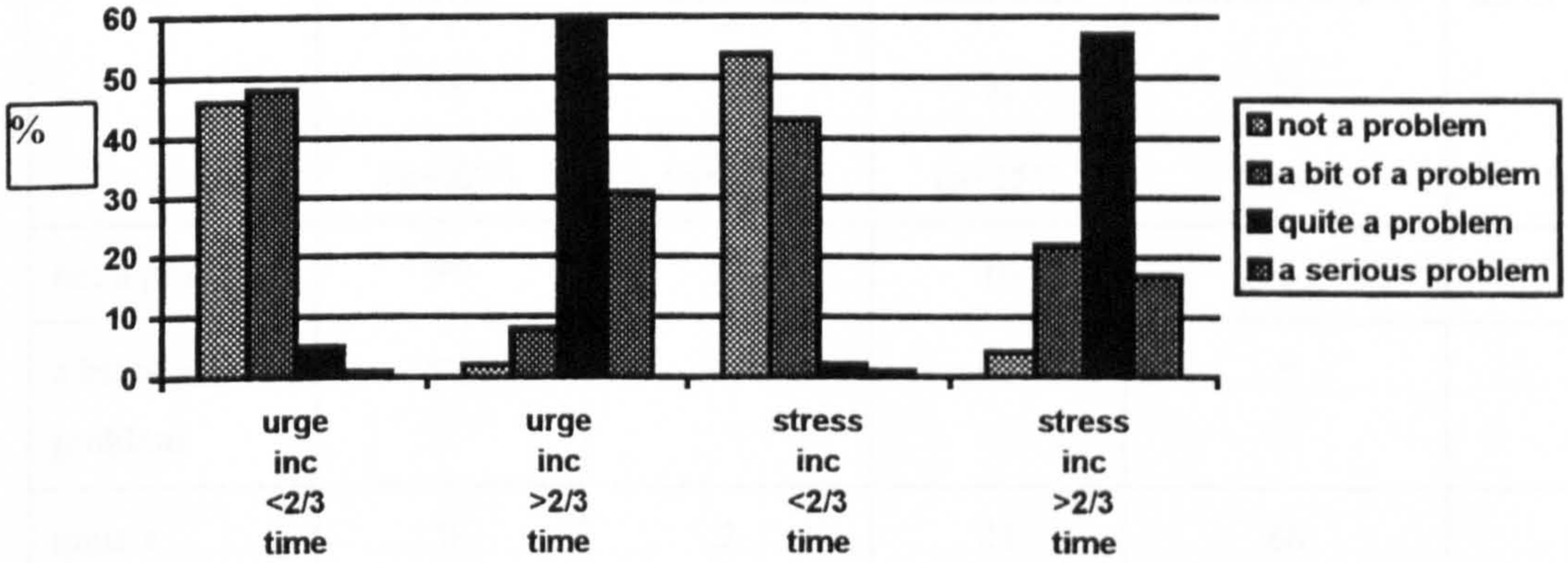


Table 6.4. The relationship between urgency and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=681)	occasionally % (n=990)	sometimes % (n=150)	most of the time % (n=61)	all of the time % (n=12)
not a problem	99	75	12	5	0
a bit of a problem	0	24	69	21	16
quite a problem	<1	1	19	66	42
a serious problem	0	0	0	8	42

Table 6.5. The relationship between urge incontinence and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=927)	occasionally % (n=726)	sometimes % (n=151)	most of the time % (n=32)	all of the time % (n=7)
not a problem	99	54	10	3	0
a bit of a problem	<1	44	68	9	0
quite a problem	0	2	21	60	57
a serious problem	0	0	1	28	43

Table 6.6. The relationship between bladder pain and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1261)	occasionally % (n=391)	sometimes % (n=58)	most of the time % (n=2)	all of the time % (n=1)
not a problem	100	60	14	0	0
a bit of a problem	0	39	69	0	0
quite a problem	0	<1	15	100	0
a serious problem	0	0	2	0	100

Table 6.7. The relationship between stress incontinence and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=657)	occasionally % (n=946)	sometimes % (n=149)	most of the time % (n=77)	all of the time % (n=25)
not a problem	100	61	7	4	4
a bit of a problem	0	38	77	27	8
quite a problem	0	<1	15	60	48
a serious problem	0	0	1	9	40

Table 6.8. The relationship between incontinence for no obvious reason and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1457)	occasionally % (n=184)	sometimes % (n=43)	most of the time % (n=8)	all of the time % (n=5)
not a problem	99	35	5	0	0
a bit of a problem	<1	61	65	37	0
quite a problem	0	4	25	50	40
a serious problem	0	0	5	13	60

Table 6.9. The relationship between hesitancy and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1221)	occasionally % (n=417)	sometimes % (n=36)	most of the time % (n=9)	all of the time % (n=3)
not a problem	99	89	36	56	33
a bit of a problem	<1	10	61	33	67
quite a problem	<1	<1	3	0	0
a serious problem	<1	0	0	11	0

Table 6.10. The relationship between straining and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1462)	occasionally % (n=132)	sometimes % (n=16)	most of the time % (n=6)	all of the time % (n=2)
not a problem	99	80	25	17	0
a bit of a problem	<1	20	75	50	50
quite a problem	<1	0	0	17	50
a serious problem	0	0	0	16	0

Table 6.11. The relationship between intermittent stream and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1201)	occasionally % (n=446)	sometimes % (n=48)	most of the time % (n=11)	all of the time % (n=2)
not a problem	99	92	60	27	0
a bit of a problem	0	8	36	64	50
quite a problem	<1	0	4	9	0
a serious problem	<1	0	0	0	50

Table 6.12. The relationship between nocturnal incontinence and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1497)	occasionally % (n=88)	sometimes % (n=13)	most of the time % (n=90	all of the time % (n=3)
not a problem	100	39	8	0	0
a bit of a problem	0	59	69	11	33
quite a problem	0	1	15	78	67
a serious problem	0	1	8	11	0

Table 6.13. The relationship between poor stream and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	stream not reduced % (n=1252)	stream reduced a little % (n=297)	stream quite reduced % (n=19)	stream reduced a great deal % (n=6)	no stream % (n=5)
not a problem	99	89	47	17	80
a bit of a problem	<1	11	48	33	20
quite a problem	<1	0	5	50	0
a serious problem	<1	0	0	0	0

Table 6.14. The relationship between dysuria and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=1178)	occasionally % (n=430)	sometimes % (n=32)	most of the time % (n=36)	all of the time % (n=1)
not a problem	100	56	16	0	0
a bit of a problem	0	42	59	33	0
quite a problem	0	1	25	33	100
a serious problem	0	<1	0	34	0

Table 6.15. The relationship between a feeling of incomplete emptying and troublesomeness, expressed as the percentage of symptomatic women who found their symptom a problem.

	never % (n=862)	occasionally % (n=655)	sometimes % (n=128)	most of the time % (n=32)	all of the time % (n=8)
not a problem	100	76	18	9	13
a bit of a problem	0	23	74	47	37
quite a problem	0	1	8	38	13
a serious problem	0	0	0	6	37

Table 6.16. Frequent voiding (>8 times a day) experienced as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=63)	40-59 yrs % (n=159)	60-79 yrs % (n=74)	≥80 yrs % n=7)
not a problem	54	48	53	28
a bit of a problem	40	36	32	29
quite a problem	6	15	14	43
a serious problem	0	<1	1	0

Table 6.17. The frequency of experiencing nocturia (≥2 times a night) as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=47)	40-59 yrs % (n=112)	60-79 yrs % (n=162)	≥80 yrs % (n=58)
not a problem	26	31	48	28
a bit of a problem	68	48	41	53
quite a problem	4	19	10	16
a serious problem	2	2	<1	3

Table 6.18. The frequency of experiencing urgency as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=274)	40-59 yrs % (n=522)	60-79 yrs % (n=345)	≥80 yrs % (n=72)
not a problem	74	60	63	49
a bit of a problem	22	32	29	39
quite a problem	3	7	7	9
a serious problem	1	1	1	3

Table 6.19. The frequency of experiencing urge incontinence as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=166)	40-59 yrs % (n=419)	60-79 yrs % (n=268)	≥80 yrs % (n=63)
not a problem	42	40	55	36
a bit of a problem	51	51	37	48
quite a problem	5	8	7	14
a serious problem	2	1	1	2

Table 6.20. The frequency of experiencing bladder pain as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=158)	40-59 yrs % (n=202)	60-79 yrs % (n=77)	≥80 yrs % n=15)
not a problem	56	50	60	40
a bit of a problem	40	46	37	53
quite a problem	3	3	3	7
a serious problem	1	1	0	0

Table 6.21. The frequency of experiencing stress incontinence as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=240)	40-59 yrs % (n=570)	60-79 yrs % (n=324)	≥80 yrs % (n=62)
not a problem	46	44	62	56
a bit of a problem	46	46	32	31
quite a problem	7	8	5	10
a serious problem	1	2	1	3

Table 6.22. The frequency of experiencing incontinence for no obvious reason as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=41)	40-59 yrs % (n=110)	60-79 yrs % (n=61)	≥80 yrs % (n=28)
not a problem	27	25	31	29
a bit of a problem	63	62	56	57
quite a problem	5	9	13	14
a serious problem	5	4	0	0

Table 6.23. The frequency of experiencing hesitancy as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=168)	40-59 yrs % (n=178)	60-79 yrs % (n=90)	≥80 yrs % (n=29)
not a problem	86	86	81	72
a bit of a problem	14	12	18	28
quite a problem	0	1	<1	0
a serious problem	0	1	0	0

Table 6.24. The frequency of experiencing straining as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=48)	40-59 yrs % (n=67)	60-79 yrs % (n=27)	≥80 yrs % (n=14)
not a problem	73	78	67	43
a bit of a problem	27	18	33	57
quite a problem	0	3	0	0
a serious problem	0	1	0	0

Table 6.25. The frequency of experiencing an intermittent stream as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=115)	40-59 yrs % (n=210)	60-79 yrs % (n=141)	≥80yrs % (n=41)
not a problem	94	86	86	81
a bit of a problem	5	13	13	19
quite a problem	1	<1	<1	0
a serious problem	0	<1	0	0

Table 6.26. The frequency of experiencing nocturnal incontinence as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 % (n=23)	40-59 yrs % (n=48)	60-79 yrs % (n=22)	≥80 yrs % (n=19)
not a problem	57	23	14	37
a bit of a problem	39	71	73	21
quite a problem	4	2	13	37
a serious problem	0	4	0	5

Table 6.27. The frequency of experiencing poor urinary stream as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=49)	40-59 yrs % (n=136)	60-79 yrs % (n=107)	≥80 yrs % (n=35)
not a problem	84	85	88	77
a bit of a problem	15	14	11	20
quite a problem	<1	<1	<1	3
a serious problem	0	0	0	0

Table 6.28. The frequency of experiencing dysuria as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=150)	40-59 yrs % (n=204)	60-79 yrs % (n=94)	≥80 yrs % (n=18)
not a problem	48	56	60	39
a bit of a problem	49	40	38	50
quite a problem	2	3	2	11
a serious problem	1	1	0	0

Table 6.29. The frequency of experiencing a feeling of incomplete emptying as a problem, expressed as the percentage of symptomatic women in each 20-year age group.

degree of problem experienced	19-39 yrs % (n=241)	40-59 yrs % (n=360)	60-79 yrs % (n=182)	≥80 yrs % (n=39)
not a problem	63	61	72	56
a bit of a problem	33	35	25	39
quite a problem	4	3	2	5
a serious problem	0	1	<1	0

Definitions of normal day and night-time voiding frequencies

The definition of abnormal day and night-time voiding frequencies used in this study were extrapolated from the voiding frequencies reported by the majority of women in previously published studies (Glenning 1985; Sommer et al 1990). In order to further justify the definitions used, the relationship between daytime frequency and perceived impact was determined. This is shown in Tables 6.30 and 6.31. Voiding between one and six times a day was troublesome to only 5% of women and voiding seven to eight times a day was troublesome to 18.9% of women. When voiding frequency increased to greater than or equal to nine times a day more than half the women found it troublesome.

A similar pattern was observed with nocturia. 17% of women found voiding once at night to be troublesome but, again, more than half the women found voiding twice a night, or more, troublesome.

These findings were therefore felt to support the definitions of daytime frequency and nocturia used in the study, that is frequency greater than eight times a day and voiding at least twice at night.

Table 6.30. Voiding frequencies tabulated against associated trouble.

	"not a problem" (%)	"a bit of a problem" (%)	"quite a problem" (%)	"a serious problem" (%)
1-6 times	1053 (95.2)	46 (4.2)	7 (<1)	0
7-8 times	432 (81.1)	94 (17.6)	6 (1.1)	1 (<1)
9-10 times	123 (56.7)	70 (32.3)	24 (11.0)	0
11-12 times	23 (39.0)	27 (45.8)	9 (15.2)	0
>13 times	5 (18.5)	11 (40.7)	9 (33.3)	2 (7.4)

Table 6.31. Nocturnal voiding frequencies tabulated against associated trouble.

	"not a problem"	"a bit of a problem"	"quite a problem"	"a serious problem"
none	680 (99.7)	2 (<1)	0	0
once time	752 (82.9)	151 (16.6)	4 (<1)	0
twice	117 (45.5)	127 (49.4)	13 (5.1)	0
three times	23 (26.1)	45 (51.1)	20 (22.8)	0
>four times	2 (5.7)	11 (31.4)	16 (45.7)	6 (17.2)

CHAPTER 7

THE RELATIONSHIP BETWEEN URINARY SYMPTOMS AND QUALITY OF LIFE

The impact of individual urinary symptoms on different aspects of quality of life

The BFLUTS questionnaire contains nine questions in the section relating to quality of life including the impact of urinary symptoms on social activities, exercise and fluid intake. An extra question that asked about the type of fluid consumed was added to the BFLUTS questionnaire for this study. It asked about which fluids were imbibed regularly, defined as at least once a day (see Appendix).

The impact of individual urinary symptoms on quality of life was determined. The percentage of all women experiencing a particular urinary symptom, who also experienced a reduction in an aspect of quality of life, is shown in Table 7.1.

After a Bonferroni adjustment for repeated testing, all symptoms were shown to influence quality of life using the chi-square test for trend ($p<0.05$), with the exception of hesitancy and restriction of physical activity where there was no relationship.
Although all urinary symptoms were shown to affect quality of life to some extent, frequency, nocturia, incontinence with no obvious cause and nocturnal incontinence were the symptoms that had the most impact.

The aspects of quality of life that were most affected by urinary symptoms were fluid restriction and avoidance of places without easy access to toilets.

Women were asked how they would feel if they had to spend the rest of their lives with their urinary symptoms unchanged. 84 women (4.5% (95%CI 3.6-5.6%) adjusted for missing data) of the 1944 who answered the question would be unhappy if their urinary symptoms remained unchanged for the rest of their lives (see Figure 7.1).

The influence of urinary symptoms and age on the overall quality of life

The effect of urinary symptoms on individual aspects of quality of life, such as avoidance of places without easy access to toilets and restriction of fluid intake, has been described above. However, in order to investigate the effect of a wide range of urinary symptoms and age on overall quality of life one outcome measure was used. Among the questions concerning quality of life is one which asks how much urinary symptoms interfere with an individual's overall quality of life (question 32).

In order to justify the use of question 32 as an indicator of quality of life, Spearman's rank correlations between the quality of life questions were calculated. The correlations between question 32 and the other six questions that related to different aspects of quality of life were similar for all questions, suggesting that all aspects contribute to overall quality of life. As would be expected, overall quality of life was highly correlated with how women felt about spending the rest of their lives with their urinary symptoms (question 34), see Table 7.2. Principal component analysis was also applied to the data after transformation of the categories to scores. The aim of principal component analysis is to find a small number of variables which account for as much of the variability in the original data as possible. Of the five activity related aspects of quality of life, fluid restriction and avoiding places without toilets made the greatest contribution to the first principal component, suggesting that these aspects of quality of life showed the greatest variability within the sample.

The broad similarity of the rank correlations between question 32 and the activity related quality of life questions, and between the weights estimated from principal component analysis, suggest that the overall quality of life question (question 32) provides an adequate summary of the women's quality of life. Therefore responses to this question were used as the outcome measure for the analyses investigating which urinary symptoms adversely affected quality of life. As there was a small number of women reporting that their quality of life was severely affected, the responses were grouped into 'not at all' versus 'a little/somewhat/a lot'.

Logistic regression was used to identify urinary symptoms prognostic of impaired quality of life, with urinary symptom scores being grouped into 'never', 'occasionally' and 'sometimes or more' for all symptom questions, apart from those relating to frequency and nocturia. Responses to the question concerning frequency were grouped into less than nine times a day, nine or ten times and eleven or more times a day. Responses to the question concerning nocturia were grouped into voiding once or less a night, voiding twice a night and three times or more a night. 14 symptom questions were considered in this analysis together with age, grouped into less than 40 years, 40 to 69 years, and 70 years and over. Two-way interactions between variables found to be associated with impaired quality of life were examined. Those found to be significant at the 5% level were retained. Data were missing for question 32 for 39 women. Complete symptom and quality of life data was available for 1876 women, (90.5%). Of these 1876 women 359 (19.1%) reported that their urinary symptoms interfered with their quality of life.

12 of the 14 symptom variables were found to be predictive of impaired quality of life. Straining (question 13) and dysuria (question 18) were the two symptoms that were omitted from the model. All other symptoms were predictive of impaired quality of life. Age was also found to be associated with poor quality of life. Interactions between symptoms, including age, were examined using forward selection, and six two-way interactions were found to be significant at the 5% level or less. These interactions were between urgency and bladder pain, nocturia and age, nocturia and stress incontinence, nocturia and intermittent stream, urgency and nocturnal incontinence, incontinence for no obvious reason and hesitancy ($p<0.05$) and were not additive. After fitting these factors there was no evidence of lack of fit ($p=0.83$). The odds ratios and 95% confidence intervals estimated from the final model are shown in Table 7.3. The numbers of women in each category are shown. The numbers are small in some categories which explains why some confidence intervals are wide.

The odds of having an overall impairment of quality of life were greatest for women who had stress incontinence at least 'sometimes', or 'occasionally' in combination with nocturia. Hesitancy at least 'sometimes', frequency and urgency in combination with

nocturnal incontinence were also particularly likely to have an adverse effect on quality of life.

As each symptom variable was grouped into three categories it was possible to examine whether the odds of a having impaired quality of life depended on symptom severity and, if not, how the odds changed with symptom severity. For seven symptoms (frequency, urge incontinence, bladder pain, intermittent stream, nocturnal incontinence, incontinence for no obvious reason and poor stream) there was no evidence to suggest that the severity of the symptom influenced the quality of life effect.

Symptom severity did however have an effect on quality of life with other urinary symptoms. Hesitancy only affected quality of life if it was experienced at least 'sometimes', whereas the odds of having quality of life impairment increased with increasing symptom severity for nocturia, urgency, stress incontinence and a feeling of incomplete emptying. This relationship was linear for nocturia, feeling of incomplete emptying and urgency, but not stress incontinence.

Table 7.1. Data from 2075 completed BFLUTS questionnaires. Prevalence of symptoms, expressed as percentages of individuals with each symptom having a degree of quality of life reduction.

	Quality of life questions						
Symptom	reduce fluid intake (%)	limit tasks (%)	avoid places without toilets (%)	interfere with physical activity (%)	interfere with social life (%)	interfere with whole Quality of life (%)	unhappy to spend rest of life with symptoms (%)
frequency* n=312	53	16	47	23	18	47	11
nocturia * n=382	45	15	48	20	18	40	12
urgency n=1251	35	11	32	15	9	27	6
urge inc n=947	37	14	33	20	11	33	8
stress inc n=1229	31	11	28	17	8	27	6
mixed stress and urge inc n=767	37	16	35	24	13	36	9
hesitancy n=487	34	11	28	13	9	30	8
noc inc * n=120	55	37	64	51	40	69	28
poor str n=379	40	14	37	20	11	35	10
straining n=163	38	16	35	21	11	41	11
inc cause* n=254	50	30	53	41	27	60	15

* most Quality of life impact

Figure 7.1. How women who experienced any urinary symptoms would feel about living the rest of their life with their urinary symptoms unchanged.

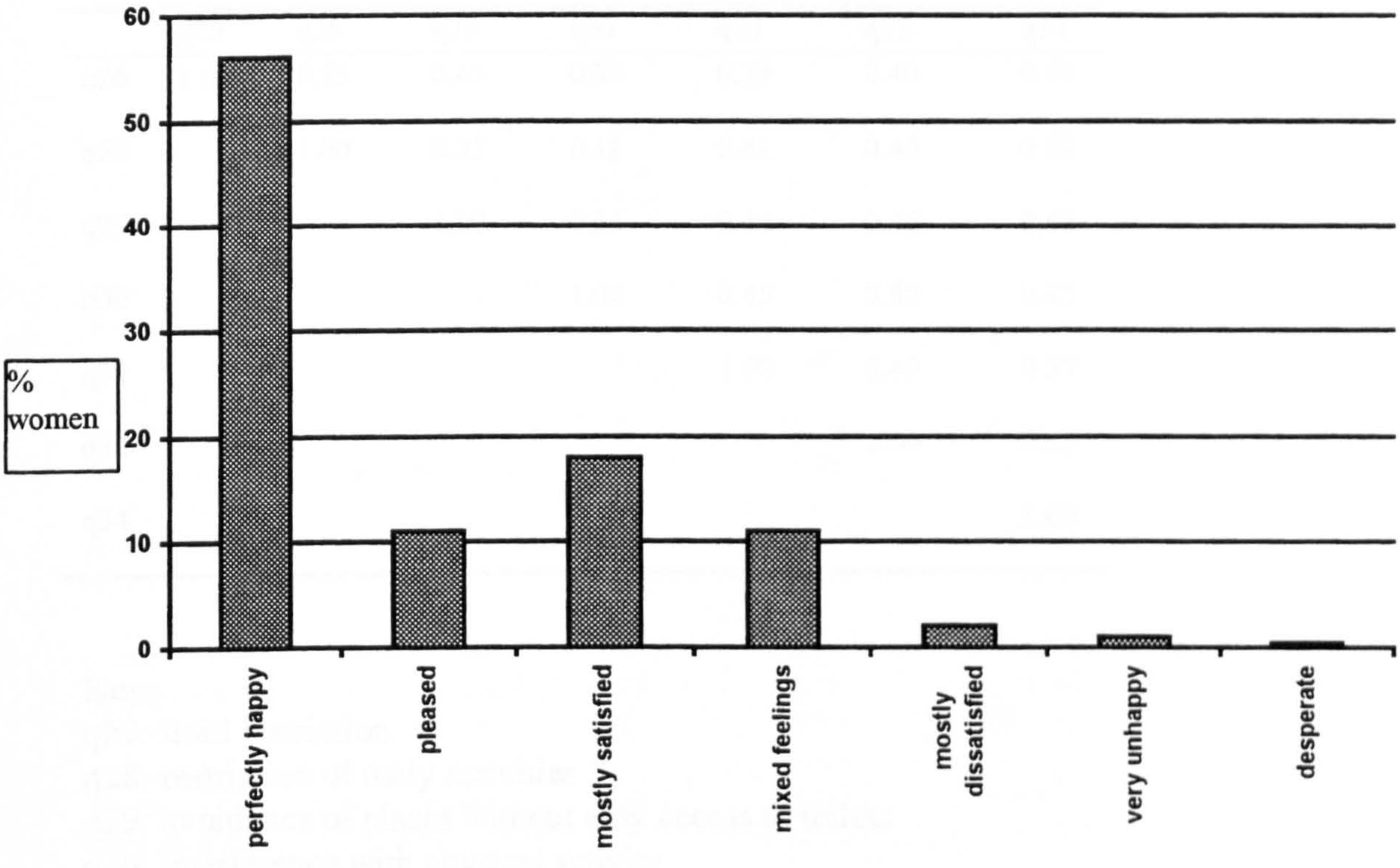


Table 7.2. Spearman's rank correlations between seven quality of life variables.

	q26	q28	q29	q30	q31	q32	q34
q26	1.00	0.25	0.45	0.30	0.29	0.40	0.40
q28		1.00	0.33	0.48	0.41	0.42	0.37
q29			1.00	0.33	0.44	0.46	0.42
q30				1.00	0.45	0.52	0.45
q31					1.00	0.49	0.37
q32						1.00	0.62
q34							1.00

Key:
q26: fluid restriction
q28: restriction of daily activities
q29: avoidance of places without easy access to toilets
q30: interference with physical activity
q31: interference with social life
q32: interference with overall quality of life
q34: how an individual would feel if they had to spend the rest of their life with their urinary symptoms unchanged

Table 7.3. Odds ratios for impaired quality of life for individual symptoms. The six symptoms with the highest odds ratios are highlighted.

symptom	number of women	odds ratio	95% confidence interval
frequency >8 times	**283**	**3.31**	**2.29-4.78**
bladder pain but no urge incontinence	174	3.21	1.88-5.49
urge incontinence and bladder pain	254	2.39	1.40-4.08
urge incontinence but no bladder pain	595	2.01	1.27-3.16
stress incontinence 'occasionally' and nocturia <2	756	1.71	1.08-2.71
stress incontinence at least 'sometimes' and nocturia <2	**155**	**9.32**	**5.32-16.3**
nocturia =2 and no stress incontinence	23	2.58	1.45-4.56
stress incontinence 'occasionally' and nocturia =2	**42**	**4.95**	**2.75-8.91**
stress incontinence at least 'sometimes' and nocturia =2	**21**	**7.59**	**3.71-15.5**
intermittent stream and nocturia <2	335	0.59	0.39-0.90
no intermittent stream and nocturia =2	23	2.58	1.45-4.56
intermittent stream and nocturia =2	17	0.94	0.48-1.82
stress incontinence 'occasionally', intermittent stream and nocturia =2*	42	1.79	0.94-3.40
urgency and no nocturnal incontinence	1045	1.50	1.11-2.02
no urgency and nocturnal incontinence	7	0.61	0.15-2.46
urgency and nocturnal incontinence	**97**	**2.70**	**1.28-5.69**
incontinence for no reason and hesitancy at least 'sometimes'	17	2.08	0.52-8.21
incontinence for no reason and hesitancy 'occasionally' or less	206	2.61	1.69-4.01
hesitancy at least 'sometimes' and no incontinence for no reason	**28**	**6.14**	**2.35-15.97**
feeling of incomplete emptying	809	2.22	1.72-2.86
age < 40 years and nocturia <2	451	1.31	0.87-1.95
age ≥ 70 years and nocturia <2	183	0.29	0.13-0.61
age ≥40 and <70 and nocturia ≥2	23	2.58	1.45-4.56
age <40 and nocturia ≥2	15	2.33	1.12-4.80
age ≥70 and nocturia ≥2	26	1.43	0.74-2.76

In this table the reference category for the interactions is a woman without symptoms. The reference category always carries an odds ratio of 1.0.
The odds ratios reported for nocturia, urgency and feeling of incomplete emptying correspond to a unit increase in the symptom level, ie 'occasionally'
For all odds ratios relating to nocturia, any of the factors with interactions not listed, ie stress incontinence, age and intermittent stream were at baseline levels of symptom absent or age ≥40 and <70 years
*= There were interactions between age, nocturia >2, stress incontinence and intermittent stream. Only one combination is shown here as it was the only combination that comprised more than 40 women

The relationship between symptom duration and quality of life

Question 33 in the BFLUTS questionnaire asks about the length of time that troublesome symptoms have been experienced, while Question 32 asks "overall, how much do your urinary symptoms interfere with your life?". In order to determine whether the length of time that troublesome symptoms were experienced affected the extent to which they interfered with an individual's quality of life, the relationship between the responses to these two questions was assessed. Perhaps not surprisingly there was a relationship, with symptoms that had been experienced longer having more impact on quality of life than symptoms of shorter duration ($p<0.001$).

The type of fluids that were commonly imbibed:

Question 27 in the modified BFLUTS questionnaire asked about the type of fluids that were taken in. Perhaps not surprisingly tea and water were the drinks most commonly consumed on a daily basis. Table 7.4 shows the type of fluids that were consumed in descending order of frequency.

In view of the way in which this question was worded it was difficult to determine the amount of missing data. No further analysis was therefore performed, but it was interesting to note that decaffeinated coffee was far more commonly drunk than decaffeinated tea even though tea was a more popular drink than coffee. This may have been due to the popular misconception that tea does not contain caffeine.

Table 7.4. The type of fluids that were consumed in descending order of frequency.

type of fluid	% women consuming beverage
tea	78
water	60
coffee	57
fruit juice	31
milk	20
alcohol	20
cola/carbonated drink	19
squash	18
decaffeinated coffee	15
decaffeinated tea	4

CHAPTER 8

THE EFFECT OF URINARY SYMPTOMS ON SEXUAL FUNCTION

The BFLUTS questionnaire contains four questions relating to sexual function as well as a "Yes/No" question asking about current sexual activity. Although the levels of missing data for this question were relatively high at 9.6%, 1875 women answered this question. As will be shown subsequently the missing data did not greatly affect the results. 1227 women, 65.4% (95%CI 63.2-67.6%) of the responders were sexually active. If adjustments are made to allow for the missing data, the percentage of women who were sexually active becomes 64.0% (95%CI 61.8-66.1%). The percentage of women who were sexually active decreased with increasing age, with 85.6% women aged 19 to 39 years, 79.2% aged 40 to 59 years, 33.6% aged 60 to 79 years and 9.1% over 80 years and over being sexually active ($p<0.0001$).

All women were asked to say whether they experienced discomfort secondary to dryness of their vagina regardless of whether or not they were sexually active. Of the 1983 responders 419 (21.1% (95%CI 19.3-23.0%)) admitted to some discomfort. There was a relationship between age and dryness of the vagina ($p<0.001$). This relationship was not linear and dryness of the vagina was experienced most commonly in women aged 40 to 59 years.

The remaining questions asked about how much individual urinary symptoms had interfered with sexual activity, dyspareunia and leakage of urine during sexual intercourse.

10.2% (95%CI 8.5-12.1%) 122 of 1193 sexually active women felt that their sex lives had been spoilt by their urinary symptoms. If adjustments are again made to allow for missing data, the percentage of sexually active women who felt that their sex lives had been spoilt becomes 10.3% (95%CI 8.7-12.1%) allowing for missing data for both sexual activity and spoilt sex life. The overall percentage of women who felt that their sex life had been spoilt was 6.6% (95%CI 5.5-7.9%), and 6.6% (95%CI 5.5-7.8%), if missing data are allowed for. These adjustments for missing data assume that the data

are missing at random, so that the observed responses reflect the true responses and that non-responders would respond in the same way as responders.

Table 8.1 shows the percentage of women with individual urinary symptoms who experienced a dry vagina irrespective of whether they were sexually active, Table 8.2 illustrates the percentage of women whose sex life was affected by their urinary symptoms. Symptoms are examined in isolation in this table. Clearly many women experience a combination of urinary symptoms which may explain surprising findings when the results are expressed in this fashion, for example the relationship between straining and leakage during intercourse.

Each question, in common with other questions in the questionnaire, also contained a second part relating to perceived bother. Table 8.3 shows the extent to which restriction of sexual activity, secondary to urinary symptoms, affected them. As this table demonstrates, having their sex life spoilt and dyspareunia were felt to be more troublesome than leakage during sexual intercourse.

Table 8.1. The percentage of women with individual urinary symptoms who experienced a dry vagina.

	dry vagina %
frequency >8 (n=295)	29.2
nocturia ≥2 (n=346)	25.4
urgency (n=1185)	24.1
urge incontinence (n=895)	26.8
bladder pain (n=442)	32.8
stress incontinence (n=1174)	23.4
incontinence for no cause (n=233)	31.3
hesitancy (n=463)	29.6
straining (n=151)	31.8
intermittency (n=502)	26.7
nocturnal incontinence (n=110)	33.6
poor stream (n=359)	28.1
dysuria (n=458)	32.1
incomplete emptying (n=850)	28.6

Table 8.2. The percentage of women with individual urinary symptoms whose sex life was affected by their urinary symptoms.

	sex life spoilt %	dyspareunia %	leakage during sex %
frequency >8 (n=201)	19.4	34.2	10.4
nocturia ≥2 (n=176)	23.3	30.8	12.8
urgency (n=789)	14.1	27.7	7.9
urge incontinence (n=599)	16.9	30.1	11.5
bladder pain (n=346)	23.7	43.5	10.8
stress incontinence (n=800)	13.0	26.9	9.1
incontinence for no cause (n=151)	34.4	40.9	27.5
hesitancy (n=338)	17.2	33.2	9.0
straining (n=117)	20.5	33.3	12.1
intermittency (n=331)	17.2	32.6	9.4
nocturnal incontinence (n=64)	53.1	45.2	42.9
poor stream (n=223)	21.1	32.7	12.7
dysuria (n=351)	17.4	38.0	10.0
incomplete emptying (n=613)	17.9	31.3	10.0

Table 8.3. The percentage of women who were troubled by the interference with their sexual function caused by their urinary symptoms.

	not a problem %	a bit of a problem %	quite a problem %	a serious problem %
dry vagina n=401	31.7	54.8	12.0	1.5
sex life spoilt n=123	16.2	56.1	17.1	10.6
dyspareunia n=289	26.6	53.3	14.2	5.9
incontinence during sex n=78	42.3	42.3	12.8	2.6

The odds ratio of individual urinary symptoms affecting sexual activity

As has already been illustrated, individual urinary symptoms affect sexual function to varying degrees with some of the relationships that exist between individual urinary symptoms and aspects of sexual dysfunction being secondary to the inter-relationships that exist between urinary symptoms (see Chapter 9). In order to study the effect that individual urinary symptoms have on sexual function, logistic regression was used to investigate urinary symptoms predictive of a spoilt sex life (question 22, see Appendix). 'Spoilt sex life' was chosen as the outcome measure for the logistic regression analysis as it embraced the various aspects of sexual dysfunction. Table 8.4 illustrates the odds ratios that were calculated for different urinary symptoms. Data on whether their sex life had been spoilt by urinary symptoms was recorded for 1193 (97.2%) of the 1227 sexually active women. These 1193 cases provided the dataset for the analysis. The urinary symptom variables were grouped into "never" versus at least "occasionally". "Spoilt sex life" was categorised as "not at all" versus at least "a little". 122 women felt that their sex life had been spoilt by urinary symptoms. Sixteen symptom variables and age were considered for inclusion in the model.

For 72 (6.0%) women, data were missing for at least one symptom variable. For 55 women data for one symptom were missing, for six women two were missing and for the remaining 11 women three or more symptoms (maximum six) were missing. For the purposes of this analysis, if the symptom data were missing it was assumed that the symptom was not present. Both forward and backward selection procedures were used to identify symptoms predictive of a spoilt sex life and both procedures gave consistent results. Interactions between the symptom variables retained in the model were investigated and none were found.

Six symptom variables were found to be associated with a spoilt sex life. These were: nocturia, urge incontinence, nocturnal incontinence, bladder pain, poor urinary stream and a feeling of incomplete emptying. Age was not shown to be an important factor in experiencing a spoilt sex life. After fitting these six factors, there was no evidence to suggest a lack of model fit (p=0.5).

Table 8.4. The odds ratios of having a spoilt sex life for different urinary symptoms.

symptom	no women with symptom	odds ratio	95% CI
nocturia ≥2	143	2.13	1.28-3.54
urge incontinence	530	2.60	1.62-4.18
bladder pain	318	3.21	2.06-4.97
nocturnal incontinence	57	4.63	2.42-8.85
poor stream	197	1.64	1.01-2.64
feeling of incomplete emptying	553	2.89	1.71-4.87

CHAPTER 9

THE RELATIONSHIPS THAT EXIST BETWEEN URINARY SYMPTOMS

Few women (only 12% of responders) described having no urinary symptoms. Although urinary symptoms can be described and studied in isolation, as has been done in previous chapters for ease of expression, many women experience a combination of urinary symptoms. In order to determine how commonly individual storage symptoms, excluding daytime incontinence, were experienced in isolation the number of women who reported daytime frequency, nocturia, nocturnal incontinence or urgency as isolated symptoms was calculated. The number of women describing each type of incontinence has already been described in Chapter 5. 1930 women had complete data for urinary symptoms and were therefore included in the analysis. The overall prevalence of frequency, urgency, nocturia and nocturnal incontinence as isolated symptoms were 0.4% (9 of 1930), 2.4% (47 of 1930), 0.9%(10 of 1930) and 0% respectively. This illustrates that it is relatively uncommon to experience urinary symptoms in isolation.

Some urinary symptoms are known to co-exist commonly, for example urgency and urge incontinence. The number of women who experienced both urgency and urge incontinence was calculated. There was complete data for 2043 women for these questions. Of these 943 women admitted to urge incontinence and 825 (87.4% of the women with urge incontinence) also had urgency showing that the majority of women who experienced urge incontinence also had urgency as expected.

There are many other relationships between urinary symptoms that are acknowledged. The relationships that exist between urgency and urge incontinence have just been cited and the inter-relationships between the different types of incontinence have been described in Chapter 5.

Correspondence analysis

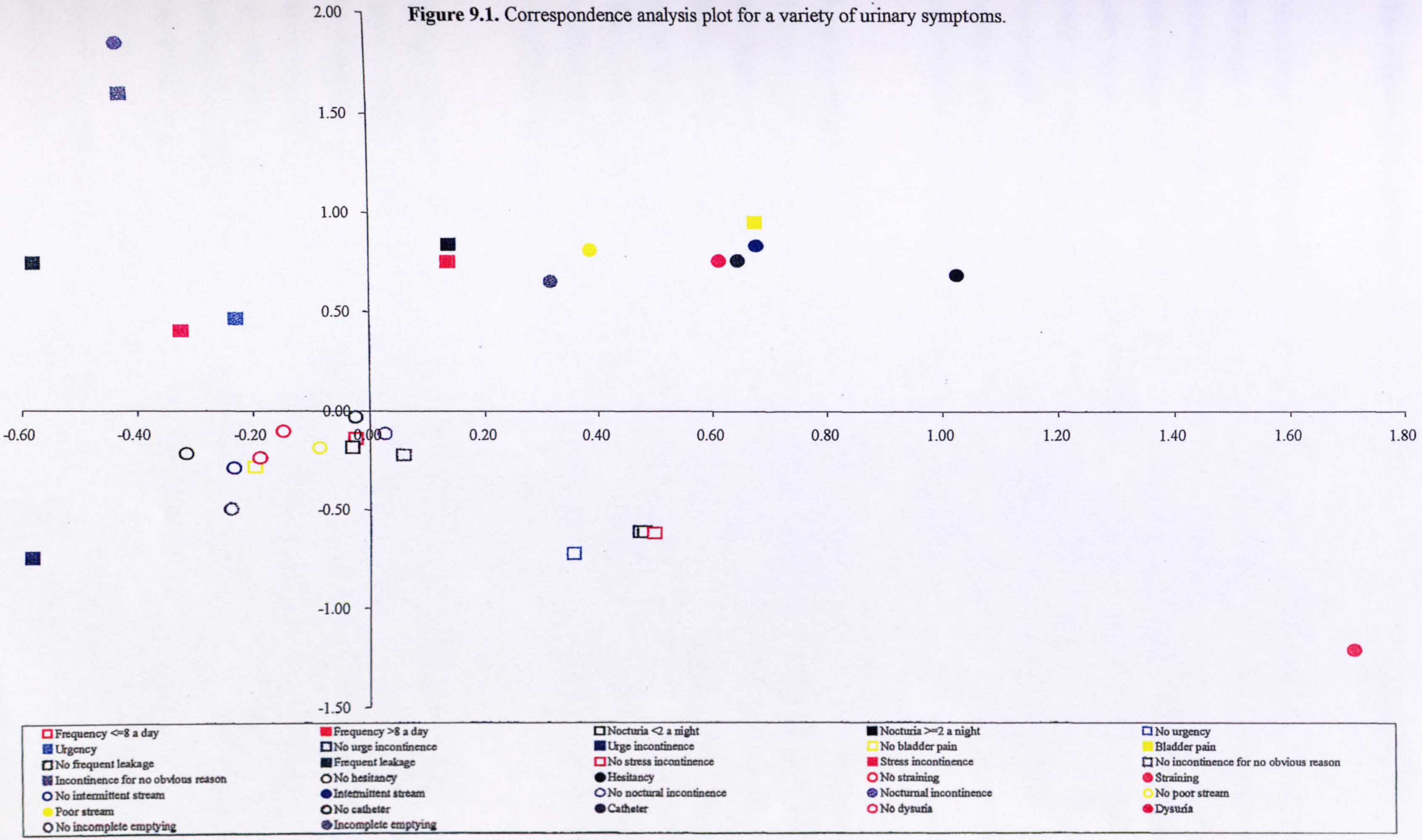
However, there may be relationships that exist between urinary symptoms that have not already been recognised. In order to detect any previously unrecognised interrelationships the data were examined using correspondence analysis. The term 'correspondence' is derived from the French 'correspondance' which was used to denote a system of associations. Correspondence analysis was devised by Jean-Paul Benzécri and is a geometric technique rather than a statistical one which can be used to summarise a complete set of categorical data (Greenacre 1984). When data is of a multivariate nature unexpected associations may be difficult to detect among the large number of tables that can be drawn from the data. Correspondence analysis can be used as an exploratory framework where associations and patterns reveal themselves.

Figure 9.1 shows the results of correspondence analysis for 16 questions from the 'urinary symptom section' of the BFLUTS questionnaire. Responses that are positioned near each other have some form of relationship with each other. As can be seen from Figure 9.1 the negative responses were grouped together, as were positive responses to questions concerning incontinence: stress incontinence, nocturnal incontinence, incontinence for no obvious reason and the question concerning frequency of leakage. Positive responses to urge incontinence were also on the left hand side of the longitudinal axis but were apart from the other questions concerning incontinence.

Positive responses to questions concerning voiding symptoms were grouped together along with positive responses to bladder pain and catheter usage. Nocturia $\geq$2 and frequency >8 were shown to have a close relationship.

Correspondence analysis has therefore revealed no unexpected relationships between urinary symptoms, but has confirmed those that have been previously described or revealed from statistical analyses.

Figure 9.1. Correspondence analysis plot for a variety of urinary symptoms.



The relationship between nocturnal incontinence and other urinary symptoms

Nocturnal incontinence was shown to be one of the most troublesome symptoms, although it is often unrecognised in women. Surprisingly both nocturia and nocturnal incontinence were shown to be related to sexual dysfunction and aspects of quality of life restriction that occurred during the daytime, such as avoidance of places without easy access to toilets. This relationship may be due to co-existing urinary symptoms, such as daytime incontinence, rather than nocturnal incontinence itself. In order to investigate this further, the relationship between nocturnal incontinence and other urinary symptoms was determined by calculating the odds ratio of having nocturnal incontinence in the presence of other urinary symptoms.

Logistic regression was used to identify factors predictive of nocturnal incontinence. Lower urinary tract symptoms were dichotomised into symptom present or absent. Day and night-time frequencies were grouped into voiding eight or less and more than eight times a day, and once or less and more than once a night respectively. Age was grouped into three categories, less than 40 years, 40-69 years and 70 years or more. The model was built using a stepwise approach. Variables found to make a significant contribution to the model at the 10% level were retained. Interactions between these variables were also examined.

Sixteen variables were considered for inclusion in the logistic regression model. Six were retained in the final model, namely urgency, nocturia_>2, stress incontinence, incontinence with no obvious cause, urge incontinence and straining. The variables that were considered but omitted from the model were: daytime frequency, pain, frequency of leakage, hesitancy, intermittent stream, poor stream, catheter use, dysuria, incomplete emptying and age. No statistically significant interactions between these variables were found. The odds ratios (and 95% confidence intervals) are given in Table 9.1. The odds of having nocturnal incontinence were significantly increased by the presence of reported urge incontinence and stress incontinence, incontinence for no obvious reason, urgency, straining and nocturia. Women experiencing incontinence for

no obvious reason were six times more likely to report nocturnal incontinence compared with women who did not have that symptom. The relationship of this form of incontinence and stress incontinence has already been described in Chapter 5.

The odds of having nocturnal incontinence were therefore increased in the presence of daytime incontinence. Nocturnal incontinence is thus a symptom that demonstrates the inter-relationships between urinary symptoms. Indeed, as already stated, no woman experienced nocturnal incontinence as a symptom in isolation.

Table 9.1. Odds ratios for experiencing nocturnal incontinence in women reporting other urinary symptoms.

symptom	nocturnal incontinence n=120 (%)	no nocturnal incontinence n=1941 (%)	odds ratio	confidence interval
urgency	108 (92.3)	1135 (59.1)	2.0	0.92-4.55
nocturia >2	56 (47.4)	321 (16.6)	2.3	1.47-3.63
stress incontinence	107 (93.0)	1117 (58.3)	2.9	1.26-6.61
incontinence no obvious cause	75 (64.6)	175 (9.1)	6.3	3.98-10.03
urge incontinence	110 (94.0)	830 (43.1)	4.8	2.04-11.29
straining	24 (20.3)	138 (7.1)	1.9	1.03-3.42

CHAPTER 10

THE PREVALENCE OF NOCTURNAL POLYURIA AMONG WOMEN IN THE COMMUNITY

Introduction

In Chapter 6 it was reported that analysis of the data from this study showed nocturia to be both a common and troublesome symptom increasing in prevalence with age (Brocklehurst et al 1972).

It is unclear whether nocturia in women represents nocturnal frequency (the frequent voiding of small volumes) possibly secondary to detrusor instability, or nocturnal polyuria (the production of a large amount of urine overnight) which may indicate pathology apart from the lower urinary tract (Mathiessen et al 1996). The management of these conditions is quite different.

There is no consensus concerning the precise definition of nocturnal polyuria. Definitions given in the literature include the production of a larger volume during a 12 hour period overnight than during a similar period during the day (Asplund and Åberg 1992) or the voiding of more than 33 or 35% of the total 24 hour output of urine overnight (Carter 1992, Saito et al 1993).

Although nocturia is recognised as being common among elderly women, few studies have attempted to determine the prevalence of nocturnal polyuria among women in the community (Asplund and Åberg 1992). We decided to investigate the age prevalence of nocturnal polyuria among women in the community and to determine whether there was any relationship between nocturia and nocturnal polyuria and between nocturnal polyuria and diuretic use.

Methods

Short urinary symptom questionnaires (see Figure 10.1) and seven day frequency/volume charts (see Figure 10.2) were sent to all 1183 women aged 50 years and over who had responded to the BFLUTS questionnaire. The short urinary symptom questionnaire asked about day and night-time voiding frequencies as well as diuretic use. The study was limited to the older women among the responders as nocturia is recognised as being particularly common in this age group. For the purposes of this study nocturnal polyuria was defined as the voiding of more than 33% of the total urinary output during sleeping hours. Women were asked to mark on their frequency/volume charts the time they retired to bed. Frequency/volume charts were deemed to have sufficient data for analysis if voided volumes were complete for at least four days of the chart.

Data were analysed using SPSS for windows and the chi-square and Fisher's exact tests to detect associations and the chi-square test for trend, to test for a trend across age groups.

Figure 10.1. Short symptom questionnaire used in the nocturnal polyuria study.

Date ☐ ☐/ ☐☐/ ☐☐ **Patient No** ☐ ☐ ☐ ☐

Age ☐ ☐ **years**

URINARY SYMPTOMS QUESTIONNAIRE

We are trying to find out how much of a problem your urinary symptoms are to you.
We would be grateful if you could help us by filling out this questionnaire.

When answering the questions, think about the **symptoms you have experienced in the past month.**

Please tick one box for each question.

1.	**During the night, how many times do you have to get up to urinate, on average?**	
	None ☐	1
	1 ☐	2
	2 ☐	3
	3 ☐	4
	4 or more ☐	5
	How much of a problem is this for you?	
	not a problem ☐	1
	a bit of a problem ☐	2
	quite a problem ☐	3
	a serious problem ☐	4

2.	**Do you take any 'water' tablets (diuretics) every day?**	
	yes ☐	1
	no ☐	2
	don't know ☐	3

Figure 10.2. Seven day frequency/volume chart used in the nocturnal polyuria study

Frequency Volume Chart Code: .....

	6 am	7	8	9	10	11	12 noon	1 pm	2	3	4	5	6	7	8	9	10	11	12 pm	1 am	2	3	4	5
Day 1																								
Day 2																								
Day 3																								
Day 4																								
Day 5																								
Day 6																								
Day 7																								

Enter the measured amounts in millilitres (mls) in the time spaces *every time* you pass urine, and mark the time you go to bed each night with a line across the space.

AVERAGE DAILY FLUID INTAKE

Record for ONE WEEK

Please fill in as per instructions and return in the enclosed prepaid envelope

IN CUPS = ...

Results

245 frequency/volume charts were returned, of which 227 had adequate volumes recorded to enable further analysis. Figure 10.3 illustrates the outcome of the mailing of 1183 frequency/volume charts and short symptom questionnaires. 264 questionnaires were available for analysis; 262 women had completed the question relating to nocturia.

22 women had moved away or died, giving a response rate of 19.5% for completed charts. The mean age of the responders was 65 years (range 50-98 years). As all the women had already completed a validated lower urinary tract symptoms questionnaire the prevalence of nocturia could be compared in their responses to the main questionnaire and to the nocturnal polyuria study. The prevalence of nocturia ≥ 2 from completed questionnaires in the main study was 25.4% (n=1173) among women aged 50 years and over, compared with 20.2% (n=262) for the nocturnal polyuria study.

Nocturnal polyuria was found to be significantly more common among those with nocturia ≥ 2 ($p<0.0001$). This is shown in Table 10.1. The prevalence of nocturnal polyuria increased disproportionately to that of nocturia with age ($p<0.001$), as can be seen in Figure 10.4.

There was no clear relationship between nocturia and daytime frequency. 28.0% of women with a daytime frequency of nine or more experienced nocturia, voiding twice or more at night, compared with 12.9% of those with a daytime frequency of eight or less ($p=0.07$). There was similarly no significant relationship between nocturnal polyuria and daytime frequency with 32.0% of those with a daytime frequency of nine or more having nocturnal polyuria, compared with 48.5% of those with a frequency of eight or less ($p=0.14$).

There was no clear relationship between diuretic use and nocturnal polyuria, with 13.6% of those with nocturnal polyuria using diuretics compared with 17.7% of those without ($p=0.42$).

Discussion

This is one of the few studies that have examined voiding habits of women in the community. Although the response rate for the completed frequency/volume chart was low at 19.5%, the prevalence of nocturia was similar to that in the original study. Women experiencing nocturia were therefore not over-represented among the responders. Nocturnal polyuria was shown to be common among women in the community, particularly among more elderly women. Nocturia in women may therefore represent either nocturnal frequency or nocturnal polyuria. It is important to distinguish between these two conditions before treating symptomatic women. Nocturnal frequency is likely to be secondary to lower urinary tract dysfunction such as detrusor instability, whereas nocturnal polyuria is probably multifactorial and secondary to pathology unrelated to the lower urinary tract.

Figure 10.3. The outcome of the mailing of the 1183 short symptom questionnaires and frequency/volume charts.

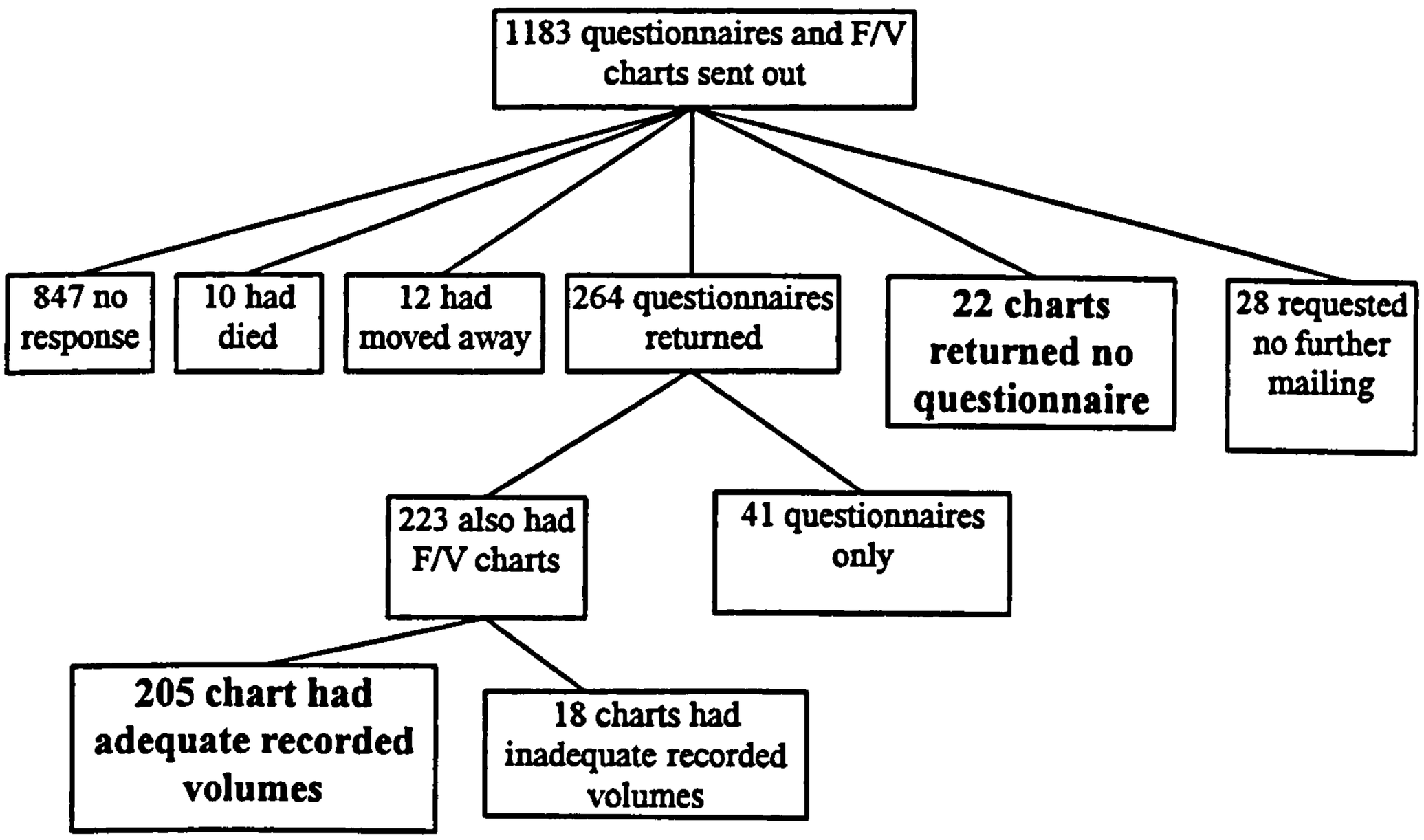
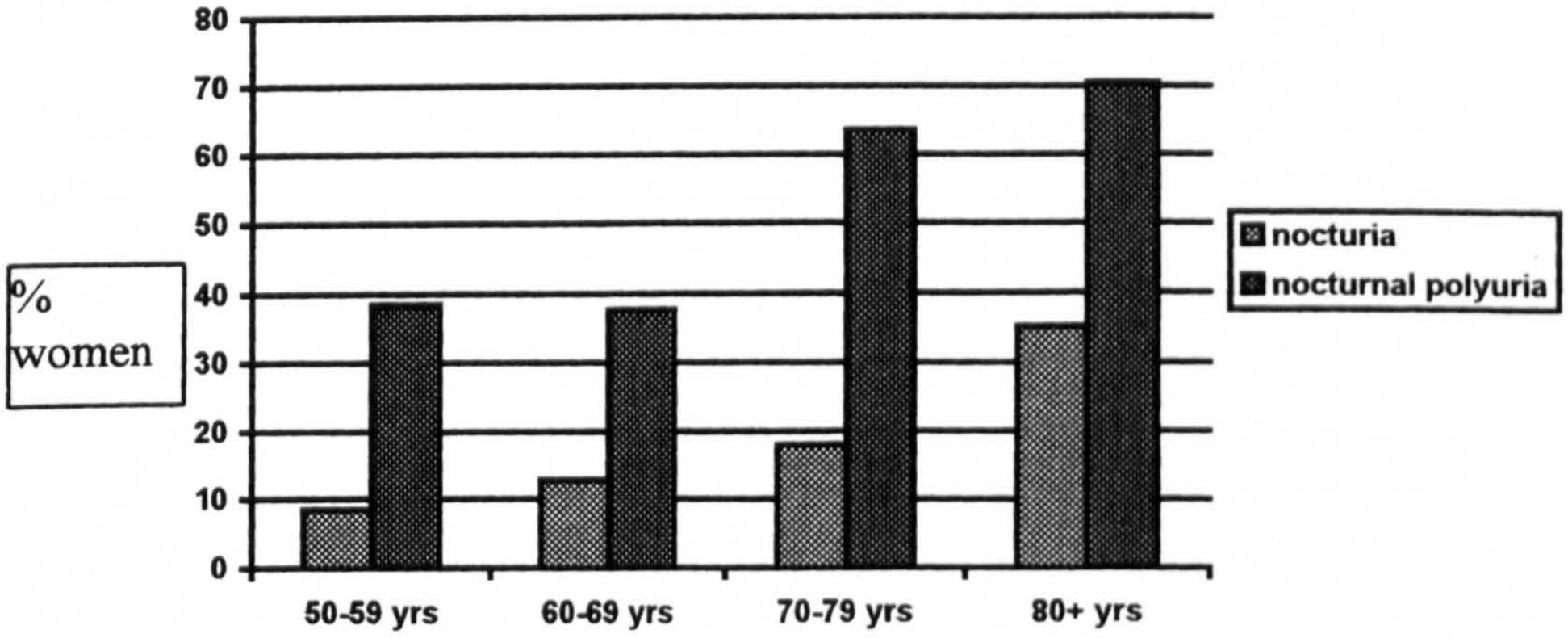


Table 10.1. Comparing the proportion of women who had nocturnal polyuria between those with and without nocturia.

	no nocturnal polyuria (%) n=121	nocturnal polyuria (%) n=106
nocturia ≤1 n=194	58	42
nocturia ≥2 n=33	24	76

Figure 10.4. Comparing the age prevalence of nocturia and nocturnal polyuria.



DISCUSSION

CHAPTER 11

DISCUSSION AND CONCLUSIONS

This study was instigated to examine in detail the prevalence of urinary symptoms among women in the community and to study the relationships that exist between symptom occurrence, perceived impact, and the effects on quality of life and sexual function. Validated patient-completed questionnaires are the preferred way of establishing the level of symptoms for medical disorders. Whilst a questionnaire such as the BFLUTS questionnaire is validated in most senses of the term, the correlations between the symptomatic complaints of both storage and voiding symptoms and urodynamic diagnosis of lower urinary tract disease are acknowledged to be poor (Bates, Whiteside and Turner-Warwick 1970).

The lack of associations between many lower urinary tract diseases and diagnoses such as urodynamic bladder overactivity may in part reflect the differing ways in which individuals interpret the same question. The question of urgency (question three) is a good example. Unless the question is elaborated, for example: "When you get a feeling you need to pass urine, is the feeling so strong that you have to stop what you are doing and rush to the toilet?", an individual might consider he or she has urgency if they cannot indefinitely delay the need to urinate, as they did when younger. A spectrum of individual interpretation is likely to apply to many of the questions in the BFLUTS questionnaire. A further factor contributing to the weak associations between lower urinary tract disorders and urodynamic diagnosis may be the relative shortcomings of urodynamic studies which provide a "snapshot" of an individual's storage and voiding functions. Bladder overactivity (detrusor instability) may vary from one filling phase to another. These factors mean that the prevalence of symptoms known to be associated with a particular disease cannot be directly translated into the prevalence of that disease. It is the severity and frequency of symptoms that may reflect an individual's perception of a lack of well-being.

The high response rate, in this study, obtained among women of all age groups over a wide age range, has meant that the prevalence of urinary symptoms and their associations could be studied in detail. Each ten-year age group contained at least 100 women owing to the large number of responders in each age group. Even though the questionnaires were returned anonymously, each questionnaire was coded to enable a second mailing. This ensured that age data could be completed even when women had failed to complete this themselves. The only exception to this was one responder who defaced her code in order to further preserve her anonymity. Her questionnaire was therefore excluded from part of the analysis.

The study was designed to ensure the maximum response rate. The accompanying letter was drawn up in consultation with the doctors in the practice and signed by them all. A business response licence was obtained to reduce postal costs in view of the number of questionnaires in the study, and also to give a professional appearance to the envelopes included for the return mailing. A second mailing was sent at six weeks which increased the response rate by 17%.

In the related study of nocturnal polyuria study, no second mailing was sent. This was because there was some evidence of response fatigue in that a few women telephoned both the hospital and GP surgery requesting that they receive no more mail. It was therefore felt that the potential loss of co-operation of both patients and staff at the surgery would not justify any potential gain from a second mailing. The value of two mailings and the use of letters signed by doctors known to individuals being investigated have previously been described as important in achieving a high response rate (Streiner and Norman 1991). The high response rate in our study further justifies this methodology.

When interpreting the findings, it is important to acknowledge the limitations of this study. The study was conducted in one practice and therefore caution should be used in extrapolating the findings to a wider population, although the practice was chosen because its social and demographic patterns were near average for the city. Although in

a review of a large number of prevalence studies, Thom (1998) found that gender, age and the different definitions used, affected prevalence rates of incontinence more than location.

Permission was not sought, for example, to access patient records and so we are unable to comment on the relationship between urinary symptoms and other factors, such as hysterectomy and parity, which may be important in explaining some of the findings. One of the aims of the study was to assess the occurrence and troublesomeness of incontinence and other urinary symptoms in women and to achieve this, we relied on patient reporting of symptoms. A disadvantage of this approach is that we were not able to collect objective clinical data, for example by pad tests or urodynamic studies. Using the validated BFLUTS questionnaire (Jackson et al 1996), however, ensured that we achieved a high response rate and collected valid and reliable data relating to the women's perceptions of the occurrence and troublesomeness of their urinary symptoms. During the study we were able to conduct further validation of the BFLUTS questionnaire.

The Bristol Female Urinary Symptoms Questionnaire

This was the first time that the BFLUTS questionnaire had been used in a study involving such large numbers of women. This study therefore served to further validate the questionnaire. The low levels of missing data for the majority of questions reinforced the acceptability of the questionnaire to the general population. Women were able to complete the questionnaire easily unsupervised.

However, there were some questions that did not appear to work as well as the majority. Question 16, which asked about the strength of urinary stream (see Appendix) had 4% missing data and question 20, concerning the ability to stop urination midstream, 2.7%. The remaining questions all had less than 2% missing data. Although questions 16 and 20 have been singled out as having higher levels of missing data than the others, their missing data was still acceptably low. The sections on sexual function and quality of life were more difficult to analyse than the symptom questions. This was

because there was a large amount of missing data, particularly in the section concerning sexual function. Responders were asked to leave this section uncompleted if they were not sexually active. However a reasonable proportion of women left the question asking whether or not they were sexually active uncompleted. It was therefore assumed for the purposes of analysis that women who left the section uncompleted were not sexually active. This may not be the case. It would perhaps be an improvement to ask women to complete all the questions concerning sexual function regardless of whether or not they were sexually active. A fifth option of "not relevant" would help to clarify the missing data.

Question 10, concerning pad usage, posed similar difficulties in interpretation as it was introduced by a question asking whether or not pads were used that demanded a "yes/no" response. Data concerning pad usage were only included in our analysis when complete. Again it is likely that the data would have been more reliable and complete if the question had been reworded to clarify when data were missing or when the questions had intentionally not been completed because pads were not used.

Missing data was relatively high for both the questions that invited a "yes/no" response. These two questions could be reformulated in a similar fashion to the other questions which might increase the response with a further choice of "not applicable" in the other questions (see Figure 11.1). Clearly any changes to the BFLUTS questionnaire would require further validation to be undertaken.

Figure 11.1. Possible changes to the questions in the section concerning sexual function.

Do you have a sex life at present?

yes ☐
no ☐

22. To what extent do you feel that your sex life has been spoilt by your urinary symptoms?

I do not have a sex life ☐
not at all ☐
a little ☐
somewhat ☐
a lot ☐

How much of a problem is this for you?

not a problem ☐
a bit of a problem ☐
quite a problem ☐
a serious problem ☐

The second part of the quality of life questions, which concerned whether interference with individual aspects of quality of life was a problem, was not analysed. Perceived impact and quality of life do appear to be similar concepts, and it therefore seems unnecessary to include questions asking about perceived impact in this section. The quality of life questions were tested for internal consistency during the study and this was found to be good with a Cronbach's alpha of 0.80.

Questions six and nine, concerning the frequency and amount of urinary leakage, were answered inconsistently and were therefore not included in the symptom analysis, apart from the correspondence analysis. This may well have been because of their position in the questionnaire, as they were separated and interspersed among questions about different types of incontinence. It appeared that some women were confused by this, thinking that the amount or frequency of incontinence related to the previous question,

rather than to incontinence as a whole. It would be better to re-order the symptom questions to clarify this.

Although this large study has shown that there are some changes that could be made to further improve the acceptability of the BFLUTS questionnaire, overall the questionnaire showed itself to be a useful tool to study the occurrence and impact of urinary symptoms. This study has shown that the BFLUTS questionnaire can be readily used in both hospital and community populations, whether or not assistance is available to aid completion.

The prevalence of urinary symptoms and their perceived impact

This large study, with its high response rate, has enabled the investigation of the prevalence and perceived impact of lower urinary tract symptoms including incontinence among women of all ages in the general population.

This study was unusual in the breadth of urinary symptoms examined. It was interesting to note that only 11.5% of women who responded denied experiencing any urinary symptoms in the month prior to completing the questionnaire. The most prevalent symptoms described were those of daytime incontinence and urgency which were experienced by over half of the women during the previous month. The questions concerning incontinence in the BFLUTS questionnaire do not use the term "incontinence", but rather "leakage of urine" which may have contributed to the large number of women who admitted to leakage, considerably more than in some other studies (O'Brien et al 1991, Brocklehurst 1993). It has been acknowledged that the way in which questions concerning incontinence are posed can affect the response given (Thom 1998). In line with other published studies, stress incontinence was described more commonly than urge incontinence as an isolated form of incontinence (Yarnell et al 1981, Samuelsson, Victor and Tibblin 1997). Less than half the women admitting to incontinence described one type in isolation. The relationships between the different forms of incontinence will be discussed later.

Although a considerable number of women admitted to urinary symptoms in the previous month, the majority of women only experienced their symptoms "occasionally" or less than one third of the time. Nevertheless, this study has shown that urinary symptoms, which are commonly perceived as "taboo" subjects (Ashworth and Hagan 1993), are common among women in the community.

The BFLUTS questionnaire includes five questions concerning voiding function. A sizeable proportion of women (19%) described a reduction in their urinary stream, while incomplete emptying and intermittent stream were among the five most commonly described urinary symptoms. This is perhaps a surprising finding, as voiding dysfunction is often considered to be confined to men, with few studies of urinary symptoms in women addressing this (Brocklehurst et al 1972).

Nocturia and nocturnal incontinence were less commonly reported than daytime incontinence, although they were more common than might have been supposed from clinical impression (18.5% and 5.8% respectively).

As the study encompassed such a large number of women with a wide age range (19-97 years) there were sufficient numbers to study age relationships. The prevalence of several urinary symptoms was related to age. Nocturia became increasingly common in the elderly, perhaps because of its association with urgency or nocturnal polyuria (qv) (Asplund 1995). Detrusor instability, and therefore urgency, has been shown to be more common in the elderly which may, in part, explain the increased prevalence of nocturia in the elderly (Ouslander 1997). The relationship between increasing age and nocturia found in this study reinforces the work of others (Brocklehurst et al 1972).

Poor stream increased in prevalence with age, perhaps reflecting deteriorating detrusor function with age (Elbadawi, Yalla and Resnick 1993a). Although few prevalence studies have addressed voiding dysfunction in women, impaired detrusor contractility with increasing age is a recognised phenomenon in women (Resnick and Yalla 1987).

Other urinary symptoms also demonstrated relationships with age. Bladder pain, dysuria and hesitancy were more common among those aged 19-29 years as previously described (Jolleys 1990), while the storage symptoms of frequency and stress incontinence were more common around the time of the menopause (Holst and Wilson 1988; Brocklehurst 1993). The explanation for the increased prevalence of bladder pain and dysuria among women aged 19-29 years is not clear, but may be related to increased sexual activity among younger women. Urinary tract infections, although common in the older women, tend to be symptomatic in younger women and asymptomatic in the elderly (Boscia et al 1986). Incontinence with no obvious cause and nocturnal incontinence were more common in those aged over 80 years, possibly reflecting the severity of incontinence in this age group. Hesitancy, which was described by younger women, may be related to inhibition associated with voiding in public places, rather than to urinary tract pathology.

The occurrence of symptoms alone does not, however, tell the whole story. When the perceived impact of individual symptoms was considered, incontinence for no obvious reason was the most problematic symptom, and although stress and urge incontinence ranked among the five most problematic symptoms, nocturnal incontinence and nocturia were perceived to be more troublesome. Incontinence for no obvious reason was associated with co-existing severe stress or urge incontinence ($p<0.001$) and therefore probably represents the more severe forms of these types of incontinence. Only three women described incontinence for no reason as an isolated form of incontinence. When urinary symptoms are studied in women, daytime incontinence tends to be the main symptom studied, perhaps because it is so common among women in the younger age groups and treatment is well defined.

As already described, there is no standard definition of incontinence. The results from this study give a prevalence of 69.0% for women reporting some incontinence during the previous month. This result mirrors other studies where prevalence rates of 41% (Jolleys 1988) and 53% (Harrison and Memel 1994) were reported. However, a smaller

proportion of women (24.6%), indicated that they needed to wear protection or that urinary leakage caused a social problem reflecting the lower prevalence figures reported by other authors (Brocklehurst 1993). 'Problematic leakage' could also be defined: 40.2% of women describing their leakage as "a bit of a problem" although it did not necessarily require wearing protection during the day or altering their lifestyle.

These results and the discrepancy between the findings of different population studies underlines the need for the redefinition of normality as regards female urinary incontinence. It may be 'normal' for women to experience some leakage of urine with stress provocation, particularly at the time of the menopause. What is more informative is the prevalence of incontinence that has become problematic hygienically or socially, which may correspond to when treatment is sought. This concept of incontinence is consistent with the ICS definition of incontinence (Bates et al 1976). In this study 29.6% of women had leakage that caused either a social or hygienic problem. The difference in the prevalence of leakage regarded as 'normal' and 'problematic' could account for some of the discrepancy between reported leakage and the number of women who seek treatment (Harrison and Memel 1994). The impact that urinary symptoms have on an individual should be taken into account before referring for treatment, as many women do not perceive their incontinence as troublesome and warranting treatment.

Significant incontinence is therefore any leakage that impacts on an individual's quality of life. In order for comparisons of prevalence to be made between different populations the prevalence of 'troublesome incontinence' should be stated. The prevalence of any degree of leakage could also be stated for academic interest if desired.

In this study the prevalence of 'troublesome incontinence' increased with age as did the use of pads with more absorbency, with 35 of 71 (49%) incontinent women aged over 80 years using some form of protection for incontinence compared with 191 of 589 (32%) incontinent women aged 40-59 years, perhaps reflecting the severity of incontinence in the older age group.

Catheter use was not associated with incontinence. This may at first appear to be a surprising finding in women. It may be a true finding or there may be other explanations for this result. Question 17, which addressed the use of catheters, asked whether catheters had ever been used because of an inability to void rather than incontinence. Question 17 in the BFLUTS questionnaire is identical to question 23 in the ICSmale questionnaire. However, catheterisation for retention of urine is recognised as being more common in men than women. Perhaps the question concerning catheters in the BFLUTS questionnaire should be omitted, or should address the use of catheters for incontinence which might have yielded a different result. Another factor was the difference between responders and non-responders. Among the non-responders were 12 women who lived in a residential psychogeriatric unit. They did not complete the questionnaires, as they were unable to do so, but a member of staff informed us that they were all catheterised for incontinence. It is possible that other more vulnerable women who require catheterisation to manage incontinence were also unable to complete the questionnaire.

This study reinforces that urinary symptoms, including incontinence, are common among women, although these symptoms are not always perceived as troublesome.

Several urinary symptoms showed a relationship between age and perceived impact, regardless of symptom severity. Storage symptoms of urgency and urge incontinence were more of a problem to the elderly, perhaps because of impaired mobility and consequent difficulty in accessing toilets (DuBeau and Resnick 1995). In contrast, stress incontinence was more troublesome to younger women, perhaps because of the restriction that it might impose upon physical activity among these women.

Symptom severity was not surprisingly associated with increased impact. Night-time symptoms were troublesome to the majority of sufferers. It is already recognised that sleep disturbance secondary to nocturia can result in a loss of well-being (Barker and Mitteness 1988). Nocturia is an important symptom in view of its association with falls in the elderly, secondary to night-time toiletting, and therefore has cost implications,

both in terms of the human cost of suffering and the economic cost of hospitalisation (Fine 1959, Stewart et al 1992).

Nocturnal incontinence which was relatively common in older women, but present in 5.8% women overall, is a symptom that has rarely been described among adult women (Brieger et al 1996), perhaps because of the misconception that it is a problem of childhood.

Normal parameters for day and night-time frequency of micturition

Although there have been a few studies that have investigated daytime voiding frequencies from urinary diaries (Glenning 1985; Sommer et al 1990), none of them have looked at when increased voiding frequencies become troublesome. As discussed when considering prevalence rates for incontinence it is not only the occurrence of a symptom that is of importance, but also the degree to which it interferes with an individual's lifestyle. When considering normal parameters for day- and night-time voiding frequencies, impact should be taken into account in addition to frequency. Clearly the amount of fluid intake has a direct relationship with voiding frequency. Some women may have increased frequency due to increased fluid intake which they might view as acceptable.

In this study, 60% of women voided between one and six times a day, with 85% voiding between one and eight times a day. If perceived impact is taken into account, it is voiding frequencies of nine or more that cause a noticeable increase in the proportion of women who find this a problem. More than half the women found a daytime frequency of nine or more a problem.

A similar picture is observed with night-time voiding. Voiding once a night is a problem for 17% of women, while voiding twice or more is troublesome to more than half the women. As already described there was a relationship between age and night-time

voiding. More than half of women aged over 40 years voided at least once a night. Voiding once a night would therefore appear to be normal in the older woman, whereas voiding twice a night or more is troublesome and can therefore be regarded as a symptom.

This large study of women in the community has enabled us to define normal day- and night-time voiding. Definitions of normal day- and night-time voiding frequencies are as follows: voiding eight times or less a day, and voiding once a night or less. From these results voiding frequencies of greater than eight times a day and once at night can be regarded as outside the range of normal and therefore as symptoms.

Relationships between urinary symptoms

It is well recognised that some urinary symptoms are related to one another. Few women in this study described storage symptoms in isolation. This was also true of incontinence. Both stress and urge incontinence were described in isolation, but less than half the women with incontinence had these types of incontinence in isolation. Two symptoms ranked among the most troublesome and had the greatest impact on quality of life and sexual function. These were incontinence for no obvious reason and nocturnal incontinence. Interestingly, only three women described incontinence for no reason as an isolated symptom and nobody described nocturnal incontinence as an isolated symptom.

There was a relationship between incontinence for no reason and the more severe forms of stress and urge incontinence as already described. When interpreting the data this should be borne in mind, and this symptom should perhaps be considered not as a clinical entity on its own but rather as a more severe form of other forms of incontinence.

There was also a clear association between nocturnal incontinence and other urinary symptoms, such as urgency, daytime incontinence and nocturia. Indeed, no woman experienced nocturnal incontinence alone, suggesting that the aetiology of nocturnal incontinence in adult women is different from that in children, with nocturnal incontinence in adult women appearing to be secondary to bladder pathophysiology. In view of this we have used the term "nocturnal incontinence" in this study rather than nocturnal enuresis with its connotations of complete emptying of the bladder while asleep. Other factors, such as functional impairment, may also contribute to the increased prevalence of nocturnal incontinence in the elderly

The effect of urinary symptoms on quality of life

The BFLUTS questionnaire contains questions concerning a variety of aspects of quality of life as already outlined. On analysing the data from the study all urinary symptoms were shown to affect quality of life to some extent, apart from straining and dysuria. The odds of having an overall impairment of quality of life were greatest for women who had stress incontinence at least 'sometimes', or 'occasionally' in combination with nocturia. Other urinary symptoms, hesitancy, frequency and urgency, were also highly predictive of impaired quality of life. Although the relationship between quality of life impairment, urgency, frequency and stress incontinernce may appear self explanatory, the adverse effect of hesitancy on quality of life is more difficult to explain.

It is not surprising that incontinence should have a large impact on quality of life. Indeed incontinence in the elderly is a well-recognised factor contributing to institutionalisation (Ekelund and Rundgren 1987). In a population study Brocklehurst (1993) found that 34% of women felt that their lifestyle had been considerably affected by their incontinence. The general restrictions imposed by incontinence reported in his study were restriction of fluid intake, avoidance of places without access to public toilets and restriction of physical activities, such as lifting. Our results were similar,

with fluid restriction, and avoiding places without easy access to toilets, being the aspects of quality of life that were most affected by urinary incontinence.

There is a paucity of information in the literature concerning the effect of urinary symptoms, other than incontinence, on quality of life. Samuelsson, Victor and Tibblin (1997), in a study of women aged 20 to 59 years, found that nocturia was significantly related to poor sleep.

In this study both stress and urge incontinence caused quality of life impairment. Some studies have reported urge incontinence as having a greater effect on quality of life than stress incontinence (Wyman et al 1987; Sandvik, Kveine and Hunskaar 1993). Wyman et al (1987) found that individuals with symptoms suggestive of bladder overactivity had a greater impairment of quality of life than individuals with stress incontinence. They hypothesised that this difference was largely due to the unpredictability of these symptoms and the greater associated loss of urine. In this study presented here more severe forms of stress incontinence were associated with a greater likelihood of having quality of life impairment than urge incontinence. However, mild forms of stress incontinence caused less quality of life impairment than urge incontinence. The likelihood of having quality of life impairment was increased if urge incontinence was experienced in combination with bladder pain, or stress incontinence was combined with nocturia. There does not therefore appear to be a simple answer to which form of incontinence causes greater quality of life impairment, which may explain some conflicting results in previous studies, with Samuelsson, Victor and Tibblin (1997) finding no difference between stress and urge incontinence in the aspects of well-being studied.

There is no consensus between studies regarding the effect of symptom severity on quality of life. Norton (1982), in a study of women attending a urodynamic clinic using a specially designed questionnaire, found no relationship between symptom severity and the impact of incontinence on quality of life, as did Kelleher, Khullar and Cardozo (1993) in a similar study using the Nottingham Health Profile. Samuelsson, Victor and Tibblin (1997), however, did reveal a relationship between the frequency of incontinent episodes and how troublesome women considered their leakage. In this study the

severity of stress incontinence did affect quality of life impairment. Although urge incontinence, nocturnal incontinence and incontinence for no obvious reason did affect quality of life, increasing symptom severity did not result in increased quality of life impairment. Three other urinary symptoms also increasingly affected quality of life with increasing symptom severity. These symptoms were urgency, nocturia and feeling of incomplete emptying.

Age was related to quality of life impairment with younger women feeling that their quality of life was more affected than older women. Nocturia interacted with age in women aged between forty and seventy years, with women who described nocturia more than twice a night having increased quality of life impairment. Hunskaar and Vinsnes (1991), in a study determining the impact of urinary incontinence on quality of life among women attending incontinence clinics, also found similar results, with younger women revealing more impairment of quality of life than older women.

As already reported, fluid restriction and avoidance of places. without easy access to toilets were the two aspects of quality of life that were most affected by urinary symptoms in our study.

Restriction of fluid intake is well recognised as a method employed to control incontinence (Brink, Wells and Diokno 1987; Herzog et al 1989; Klemm and Creason 1991), although its efficacy as a method of controlling urinary symptoms is not proven. Griffiths et al (1993), in one of the few relevant studies looking at the effect of fluid restriction on urinary symptoms in women, reported that fluid restriction yielded only a small reduction in nocturnal incontinent episodes. The restriction of fluid as a means of controlling urinary symptoms is not exclusive to women. In a study of the impact of urinary symptoms on quality of life using the ICSQuality of life, Donovan et al (1997) found that storage symptoms were found to be closely related to reduction of fluid intake.

Limitation of physical activity has been described as occurring secondary to incontinence (Norton et al 1988). In our study physical activity was restricted in 17-

41% of incontinent women. Surprisingly, physical activity was not more restricted in women with stress incontinence, in this study, than in other forms of incontinence. This may well be due to the fact that a mild degree of stress incontinence is common in women, and they may choose to wear protection to absorb small amounts of leakage rather than limit their activities. Physical activity was more restricted in women with severe stress incontinence, but the differences were not great.

Women were asked to consider how they would feel if their urinary symptoms remained unchanged for the rest of their lives. Of the 1944 women who responded to the question, 15% had at least mixed feelings about that prospect, with one in two hundred women feeling desperate about their symptoms.

The effect of urinary symptoms on sexual function

The use of the BFLUTS questionnaire in this study enabled an analysis of the impact of urinary symptoms on sexual function. Although urinary symptoms are acknowledged to affect sexual function in women, there is a lack of information in the literature concerning the relationships between urinary symptoms and sexual function in women in the community. This study, with its use of the BFLUTS questionnaire giving detailed information about a wide range of urinary symptoms, has provided relevant data for this analysis. There was, however, some difficulty in interpretation of the data owing to the levels of missing data for questions concerning sexual activity. As already discussed, it was difficult to be certain about whether the failure to respond to a question meant that the individual was not sexually active or was simply embarrassed at being asked the question. The pilot study provoked comments about the intrusiveness of questions relating to sexual function, perhaps indicating that older women are reluctant to discuss sexual function. Levels of missing data were most marked among older women, as proportionately fewer older women were sexually active. The failure to respond probably indicated that the question was not relevant. However, this was not certain.

Sexual activity declined with age among women as might be expected (Diokno, Brown and Herzog 1990), but a significant proportion of elderly women were still sexually active. Women were asked whether they suffered from vaginal dryness. The proportion of women suffering with a dry vagina was related to age, being most common around the menopause (40 to 59 years). Some urinary symptoms were seen to affect sexual activity adversely, although the proportions of women who admitted to their sex life being spoilt was lower than the 46% described by Sutherst (1979) and the 56.5% by Kelleher et al (1994). This may well have been due to the different populations studied. In our study we looked at all women regardless of whether they had consulted a health professional for their incontinence. Sutherst and Kelleher et al were investigating groups of women who had been referred to a urodynamic clinic for investigation of their symptoms. By definition, these women were more troubled by their symptoms. Lam et al (1992) describe a much smaller percentage of women as abstaining from sexual activity because of incontinence. The BFLUTS questionnaire asks about sexual activity being spoilt rather than ceasing because of activity. This may explain why our results fell between these two figures.

Nocturnal incontinence and urge incontinence, in particular, were likely to spoil a woman's sex life. The strong relationship between nocturnal incontinence and severe forms of urge or stress incontinence may explain why there was such a strong relationship between a spoilt sex life and nocturnal incontinence. Urinary symptoms other than incontinence, such as poor stream, were more unexpectedly related to a spoilt sex life. The explanation for this was not obvious, but probably again reflects the relationships between urinary symptoms. Women were asked whether the interference with sexual activity was a problem to them. Women who described either dyspareunia or having their sex lives spoilt by their urinary symptoms, perceived this as more of a problem than incontinence during sex. An explanation for this may be that only those women with severe leakage during sex would regard this as spoiling their sex lives.

Nocturnal polyuria among community dwelling older women

In view of the impact that nocturnal symptoms had on responders to the questionnaire, a study involving urinary diaries was undertaken to provide more information concerning nocturia. This is one of the few studies that have examined voiding habits of women in the community (Asplund and Åberg 1992). Although the response rate for the completed frequency/volume chart was low at 19.5%, the prevalence of nocturia was similar between responders and non-responders. There was thus no obvious difference between responders and non-responders regarding the presence of nocturia. Nocturia in women may represent either nocturnal frequency, the frequent voiding of small volumes or nocturnal polyuria, the voiding of more than 33% of the total urinary output between midnight and 8 am (Carter 1992). It is important to distinguish between these two conditions before treating symptomatic women. Nocturnal frequency is likely to be secondary to lower urinary tract pathology such as detrusor instability, whereas nocturnal polyuria is probably multifactorial and secondary to pathology unrelated to the lower urinary tract, such as abnormal secretion of atrial natriuretic peptide (Carter, McConnell and Abrams 1992), loss of diurnal variation in antidiuretic secretion (Asplund 1995) or poor concentrating abilities of the kidney with increasing age (Lubran 1995).

In this study nocturnal polyuria was related to nocturia, which is not surprising. Nocturnal polyuria was, however, increasingly common with increasing age. The increase in the occurrence of nocturnal polyuria was greater than nocturia ≥ 2, which showed that the age-related increase in nocturnal polyuria was not purely secondary to the increase in the prevalence of nocturia. Nocturnal polyuria is thus a considerable cause of nocturia in the community, certainly among elderly women. Nocturia, which is such a troublesome symptom may therefore commonly be secondary to factors other than disorders of the lower urinary tract.

As an association between nocturnal polyuria and an increase in atrial natriuretic peptide and thus subclinical cardiac failure has been postulated, a question concerning diuretic

use was included with the urinary diary. There was no statistically significant difference between diuretic use in women who did and did not experience nocturnal polyuria.

Relationships between daytime frequency and nocturia were examined. If detrusor instability were commonly related to nocturia, it would be expected that a relationship would exist between daytime frequency and nocturia. Daytime frequency was not, however, related to nocturia, again reinforcing that nocturia is not always related to pathology of the lower urinary tract.

CONCLUSIONS

In this study the use of the BFLUTS questionnaire ensured a high response rate and the collection of valid and reliable data relating to the prevalence, severity and women's perceptions of the troublesomeness of their urinary symptoms.

The high response rate and small quantity of missing data in this study provide further evidence of the acceptability, validity and reliability of the BFLUTS questionnaire in the general population. However, using the questionnaire in such an extensive study has revealed where a few minor changes could be made to improve the questionnaire even further.

Urinary symptoms, including incontinence, were shown to be common among women, although they are not always perceived as problematic. Not all individuals who admit to urinary symptoms are troubled by them, and may therefore not seek treatment. While prevalence studies should continue to evaluate the occurrence of lower urinary tract symptoms and incontinence for academic interest, this study suggests that taking into account the perceived impact caused by symptoms may be much more useful in assessing the desire or need for treatment.

In view of the finding that night-time symptoms are so troublesome, and are described by a reasonable proportion of women, perhaps more effort should be directed at investigating these symptoms further. A number of women seeking help for other symptoms may have co-existing nocturnal incontinence, but feel unable to admit to this. This study highlights that clinicians should be aware of the possibility of nocturnal incontinence when approached by women with incontinence or filling symptoms such as urgency and nocturia. They should ask about this directly to enable women, who may be suffering in silence, to discuss their fears.

Nocturia and nocturnal polyuria were found to be present in a considerable proportion of elderly women. At present, the management of these conditions is unsatisfactory and the findings of this study emphasise the need for further research into these conditions in women.

On the basis of the findings of this study, definitions for normal frequencies of day- and night-time voiding frequencies are as follows: $\leq$ eight for daytime voiding and $\leq$ one for night-time voiding.

Urinary symptoms were shown to effect both sexual function and quality of life. The aspects of quality of life that were most effected were restriction of fluids and avoidance of places without easy access to toilets. Data from this study suggests that simple measures such as the better provision of public toilets could improve the quality of life of a considerable number of women.

Perhaps the main conclusion from this detailed study is that urinary symptoms affect the majority of women of all ages. Efforts should continue to be made to increase public awareness and remove the taboo that surrounds these symptoms.

AREAS FOR FUTURE RESEARCH

While undertaking this study two further areas of research have emerged which follow on from the work described in this dissertation. The broad outlines for future work are outlined below.

Study 1: The relationship between urinary symptoms, parity, other medical conditions and prescribed medication.

This study has used a self-completed validated questionnaire to look at the relationships that exist between urinary symptoms, perceived impact, impact on quality of life and sexual function. The study guaranteed anonymity in order to increase the response rate, and thus the information that could be obtained from the data. One limitation of the study, previously discussed in Chapter 11, was that the study was confined to the questionnaire alone with little data other than ages and addresses being available concerning both responders and non-responders. It would be interesting to take this study further, placing the data in the context of other medical conditions, current prescribed medication and parity. Ethics committee approval would first have to be sought in order to access patient records. Information concerning parity, previous hysterectomy, recurrent urinary tract infections and medication (in particular diuretics, alpha blockers and anticholinergics) could then be obtained. This would give fuller information concerning any relationships between any of the above and urinary symptoms.

Study 2: The relationship between troublesome urinary symptoms and the desire for treatment

This study has highlighted the discrepancy that exists between symptom occurrence and the desire for treatment. In order to determine how this is expressed in the need for Continence services, the impact that urinary symptoms have on consultation rates could be studied. This proposed study would provide information about whether women who

describe troublesome urinary symptoms visit their general practitioner for treatment, or whether they suffer in silence. The reasons for not seeking treatment would also be studied to determine whether a need existed for increased education concerning urinary symptoms or the provision of more services at the level of Primary Care.

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PUBLICATIONS, PRESENTATIONS AND AWARDS

PUBLICATIONS

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Do urinary symptoms ruin your sex life?

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24th International Urogynecological Society, Denver, USA. 1999.

RESEARCH GRANTS AND AWARDS OBTAINED:

Research Studentship awarded 1995 by the NHS Executive South and West to study urinary symptoms in women: relationships between occurrence, age prevalence, perceived bother and quality of life and "The effect of fluid and pH manipulation on urinary symptoms".

APPENDIX

Name..... Patient No ☐☐

Date ☐☐☐☐☐ Date of Birth ☐☐☐☐☐

URINARY SYMPTOMS QUESTIONNAIRE

We are trying to find out how much of a problem your urinary symptoms are to you. We would be grateful if you could help us by filling out this questionnaire

When answering the questions think about the **symptoms you have experienced in the past month.**

You will see that some questions ask if you have a problem occasionally, sometimes or most of the time.

Occasionally = **less than one third of the time**
Sometimes = **between one third and two thirds of the time**
Most of the time = **more than two thirds of the time**

Please tick one box for each question

1. During the day, how many times do you urinate on average?

1 to 6 times ☐	1
7 to 8 times ☐	2
9 to 10 times ☐	3
11 to 12 times ☐	4
13 or more times ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

2. During the night, how many times do you have to get up to urinate, on average?

none ☐	1
1 ☐	2
2 ☐	3
3 ☐	4
4 or more ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

3. Do you have to rush to the toilet to urinate?

never ☐ 1
occasionally (less than one third of the time) ☐ 2
sometimes (between one and two thirds of the time) ☐ 3
most of the time (more than two thirds of the time) ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

4. Does urine leak before you can get to the toilet?

never ☐ 1
occasionally ☐ 2
sometimes ☐ 3
most of the time ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

5. Do you have pain in your bladder?

never ☐ 1
occasionally ☐ 2
sometimes ☐ 3
most of the time ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

6. How often do you leak urine?

never ☐ 1
once or less per week ☐ 2
2-3 times per week ☐ 3
once per day ☐ 4
several times per day ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

7. Does urine leak when you are physically active, exert yourself, cough or sneeze?

never ☐ 1
occasionally (less than one third of the time) ☐ 2
sometimes (between one and two thirds of the time) ☐ 3
most of the time (more than two thirds of the time) ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

8. Do you ever leak urine for no obvious reason and without feeling that you want to go?

never ☐ 1
occasionally ☐ 2
sometimes ☐ 3
most of the time ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

9. How much urinary leakage occurs?

No leakage ☐ 1
Drops/pants damp ☐ 2
Dribble/pants wet ☐ 3
Floods, soaking through to outer clothing ☐ 4
Floods, running down legs or onto floor ☐ 5

10A. Do you have to change your underclothes or wear protection because of your leakage?

YES/NO
If NO please go to question 12
If YES please answer below

Change underclothes ☐ 1
Panty liners/mini pads ☐ 2
Maxi/super sanitary towels ☐ 3
Nappies/Incontinence products ☐ 4
Other; please specify.....

10B How many times a day do you change the above items because of leakage

No change required ☐ 1
1 ☐ 2
2-3 ☐ 3
4-5 ☐ 4
More than 5 times ☐ 5

11. Do you need to change your <u>outer clothing</u> during the day because of urine leakage?

never ☐ 1
occasionally ☐ 2
sometimes ☐ 3
most of the time ☐ 4
all of the time ☐ 5

12. Is there a delay before you can start to urinate?

never ☐ 1
occasionally (less than one third of the time) ☐ 2
sometimes (between one and two thirds of the time) ☐ 3
most of the time (more than two thirds of the time) ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

13. Do you have to strain to urinate?

never ☐	1
occasionally ☐	2
sometimes ☐	3
most of the time ☐	4
all of the time ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

14. Do you stop and start more than once while you urinate without meaning to?

never ☐	1
occasionally ☐	2
sometimes ☐	3
most of the time ☐	4
all of the time ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

15. Do you leak urine when you are asleep?

never ☐	1
occasionally ☐	2
sometimes ☐	3
most of the time ☐	4
all of the time ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

16. Would you say that the strength of your urinary stream is...

not reduced ☐ 1
reduced a little ☐ 2
quite reduced ☐ 3
reduced a great deal ☐ 4
no stream ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

17. Have you ever blocked up completely so that you could not urinate at all and had to have a catheter to drain the bladder?

no ☐ 1
yes, once ☐ 2
yes, twice ☐ 3
yes, more than twice ☐ 4

18. Do you have a burning feeling when you urinate?

never ☐ 1
occasionally (less than one third of the time) ☐ 2
sometimes (between one and two thirds of the time) ☐ 3
most of the time (more than two thirds of the time) ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

19. How often do you feel that your bladder has not emptied properly after you have urinated?

never ☐ 1
occasionally ☐ 2
sometimes ☐ 3
most of the time ☐ 4
all of the time ☐ 5

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

20. Can you stop the flow of urine if you try while you are urinating?

Yes, easily ☐	1
Yes, with difficulty ☐	2
No, cannot stop it flowing ☐	3

Sexual Matters

Please think about the past month

21. Do you have pain or discomfort because of a dry vagina?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

Do you have a sex life at present?

YES/NO

If YES please go to question 22

If NO please go to question 25

22. To what extent do you feel that your sex life has been spoilt by your urinary symptoms

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

23. Do you have pain when you have sexual intercourse?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

24. Do you leak urine when you have sexual intercourse?

not at all ☐ 1
a little ☐ 2
somewhat ☐ 3
a lot ☐ 4

How much of a problem is this for you?

not a problem ☐ 1
a bit of a problem ☐ 2
quite a problem ☐ 3
a serious problem ☐ 4

Lifestyle

Please think about the past month

25. How often do you pass urine during the day?

Hourly ☐	1
Every 2 hours ☐	2
Every 3 hours ☐	3
Every 4 hours or more ☐	4

How much of a problem is this for you?

Not a problem ☐	1
A bit of a problem ☐	2
Quite a problem ☐	3
A serious problem ☐	4

26. Do you cut down on the amount of fluid you drink so that your urinary symptoms improve, and you can do the things that you want to do?

never ☐	1
occasionally ☐	2
sometimes ☐	3
most of the time ☐	4
all of the time ☐	5

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

27. Which of the following do you drink regularly (at least once a day)?

water ☐	1
squash ☐	2
fruit juice ☐	3
coffee ☐	4
coffee (decaffeinated) ☐	5
tea ☐	6
tea (decaffeinated) ☐	7
milk ☐	8
alcohol ☐	9
cola or fizzy drinks ☐	10

28. To what extent have your urinary symptoms affected your ability to perform daily tasks (e.g. cleaning, DIY, lifting objects)?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this for you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

29. Do you avoid places and situations where you know a toilet is not nearby (e.g. shopping, travelling, theatre, church)?

never ☐	1
occasionally ☐	2
sometimes ☐	3
most of the time ☐	4
all of the time ☐	5

How much of a problem is this to you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

30. Do your urinary symptoms interfere with physical activity (e.g. walking, dancing, swimming)?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this to you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

31. How much do your urinary symptoms interfere with your social life (going out, meeting friends and so on)?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

How much of a problem is this to you?

not a problem ☐	1
a bit of a problem ☐	2
quite a problem ☐	3
a serious problem ☐	4

32. Overall, how much do your urinary symptoms interfere with your life?

not at all ☐	1
a little ☐	2
somewhat ☐	3
a lot ☐	4

33. How long have you had urinary symptoms <u>that bother you?</u>

less than 1 year ☐	1
1-2 years ☐	2
2-3 years ☐	3
more than 3 years ☐	4

34. If you had to spend the rest of your life with your urinary symptoms as they are now, how would you feel?

Perfectly happy ☐	1
Pleased ☐	2
Mostly satisfied ☐	3
Mixed feelings ☐	4
Mostly dissatisfied ☐	5
Very unhappy ☐	6
Desperate ☐	7

35. Which of your urinary symptoms bother you most at the moment?
(please list the symptoms that bother you most below. Please describe the symptoms in your own words, or write the number of the question that comes closest to describing them):

1.

2.

3.

THANK YOU FOR YOUR HELP

If you have any comments you would like to make about the questionnaire or your urinary symptoms please use the space below